

DOCUMENT RESUME

ED 277 571

SE 047 671

TITLE Subregional Training Workshop on Nonformal Environmental Education for Asia. Final Report.

INSTITUTION United Nations Educational, Scientific, and Cultural Organization, Paris (France). Environmental Education Section.

PUB DATE 18 Nov 85

NOTE 151p.; Organized by Universiti Pertanian Malaysia (UPM). For a related document, see SE 047 670.

AVAILABLE FROM UNESCO Press, 7 place de Fontenoy, Paris 75700, France.

PUB TYPE Collected Works - Conference Proceedings (021) -- Reports - Descriptive (141)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.

DESCRIPTORS *Conservation (Environment); Developing Nations; Energy; *Environmental Education; Ethics; Foreign Countries; *International Educational Exchange; International Programs; *Natural Resources; *Nonformal Education

IDENTIFIERS *Asia; *Environmental Education Research; UNESCO

ABSTRACT

The Subregional Training Workshop on Nonformal Environmental Education for Asia was organized by Universiti Pertanian Malaysia in cooperation with UNESCO-UNEP International Environmental Education Programme (IEEP). The workshop aimed to familiarize participants with IEEP's sourcebook on nonformal environmental education. This report contains resumes of the chapters of the sourcebook and suggestions for local adaptation of the sourcebook in the participating countries. Summaries are also provided on how nonformal environmental education programs are carried out in the countries of India, Indonesia, Malaysia, Philippines, Sri Lanka, and Thailand. Sections in this final report include: (1) an introduction; (2) an integrated summary of the participating country's programs; (3) an explanation of IEEP; (4) the sourcebook's outline; (5) an overview of nonformal environmental education; (6) some basic environmental knowledge; (7) environmental problems; (8) natural resources; (9) energy and its uses; (10) development; (11) environmental ethics; (12) suggestions for local adaptation of the sourcebook; and (13) eight appendices. (ML)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

X This document has been reproduced as
received from the person or organization
originating it.
☐ Minor changes have been made to improve
reproduction quality.

• Points of view or opinions stated in this docu-
ment do not necessarily represent official
OERI position or policy.

"PERMISSION TO REPRODUCE THIS
MATERIAL IN MICROFICHE ONLY
HAS BEEN GRANTED BY

*Susanne
Adlung*

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

FINAL REPORT

UNESCO-UNEP INTERNATIONAL ENVIRONMENTAL EDUCATION PROGRAMME (IEEP)

FINAL REPORT
SUBREGIONAL TRAINING WORKSHOP
ON NONFORMAL ENVIRONMENTAL EDUCATION FOR ASIA

organized by
UNIVERSITI PERTANIAN MALAYSIA
in cooperation with
IEEP

18-22 November 1985
Serdang, Selangor, Malaysia

PREFACE

The Subregional Training Workshop on Non-formal Environmental Education for Asia was organized by Universiti Pertanian Malaysia (UPM) in cooperation with Unesco-UNEP International Environmental Education Programme (IEEP). The workshop was held from 18 - 22 November 1985 in the Centre for Extension and Continued Education of the Universiti Pertanian Malaysia, Serdang, Selangor, Malaysia.

The objectives of the workshop were (i) to familiarize participants with the contents of a Sourcebook on Nonformal Environmental Education prepared under IEEP and obtain their comments for its revision, (ii) to explore ways and identify institutions for local adaptation of the Sourcebook in the participating Member States, and (iii) to exchange information and experience in the development of environmental education in the subregion.

The workshop was inaugurated by Professor Dato' Dr. Nayan Ariffin, Vice-Chancellor of UPM and closed by Dr. Salihan Siahs, Acting Dean of Faculty of Science and Environmental Studies, UPM.

This report contains a summary on how non-formal environmental education programmes are carried out in the participating countries of India, Indonesia, Malaysia, Phillipines, Sri Lanka and Thailand; resumes and deliberations on the eight chapters of the sourcebook and suggestions and recommendations on local adaptation of the sourcebook.

CONTENTS

I.	Introduction	1
II.	Integrated Summary of the Country Reports and Discussions	8
III.	UNESCO-UNEP International Environmental Education Programme	14
IV.	Preparatory Outline of the Sourcebook	22
V.	Overview of Non-formal Environmental Education	34
VI.	Some basic Knowledge about the Environment	46
VII.	Environmental Problems	65
VIII.	Natural Resources	75
IX.	Energy and Its Uses	83
X.	Development	95
XI.	Environmental Ethics	109
XII.	Suggestions for Local Adaptation of the Sourcebook	125
XIII.	Appendices	127

I. INTRODUCTION

1. Background:

The Subregional Training Workshop on Non-formal Environmental Education for Asia was organized by Universiti Pertanian Malaysia (UPM) in cooperation with UNESCO-UNEP International Environmental Education Programme (IEEP). The workshop was organized under a UNESCO contract and in the context of its Programme and Budget for 1984-1985 as an activity of UNESCO-UNEP International Environmental Education Programme of the Division of Science, Technical and Environmental Education.

IEEP prepared the objectives, agenda, information note, timetable of work, and the working document (Draft Sourcebook in Non-Formal Environmental Education) for the workshop. Similarly, IEEP provided the funds for the preparation and organization of the workshop as well as a set of Environmental Education reference documents for each participant and observer. UNESCO was represented by Dr. Abdul Ghafoor, Programme Specialist in Environmental Education, who served as a resource person in providing technical support to the workshop and assisting in its organization.

Universiti Pertanian Malaysia (UPM) issued invitations to Member States, issued travel tickets to nominated participants, received them on arrival and accompanied them to the Centre for Extension and Continuing Education, in its campus where the participants were accommodated and where the workshop was also held. UPM also provided six educators who made resumes of six chapters in the Sourcebook on Non-Formal Environmental Education. Each educator presented the relevant chapter to the workshop and conducted its discussion.

UPM administered the organization of the workshop, prepared its draft final report and reproduced the final version of it for dissemination after study by participants and approval of UNESCO.

UPM had appointed an Organizing Committee under the chairmanship of the Dean of the Faculty of Science and Environmental Studies for overseeing the many aspects of the preparation, organization and concluding of the workshop.

2. Objectives

The objectives of the workshop were:

- (i) To familiarize participants with the contents of a Sourcebook on Non-Formal Environmental Education prepared under the UNESCO - UNEP International Education Programme (IIEP) and obtain their comments for revision of the Sourcebook.
- (ii) To and identify institutions and explore ways and means for local adaptation of the sourcebook in the participating Member States.
- (iii) To exchange information and experience in the development of environmental education in the subregion.

3. Date and Venue

The workshop was held from 18-22th November 1985 in the Centre for Extension & Continuing Education of the Universiti Pertanian Malaysia, Serdang, Selangor, Malaysia.

4. Bureau of the Workshop

Chairman : Dr. Mohd. Ismail Yaziz (Malaysia)
Deputy Chairman : Dr J.P. Gupta (India)
Rapporteurs : Mr. A.K. Gunapala (Sri Lanka)
Dr. P. L. Basilio (Philippines)

5. Steering Committee

The steering committee consisted of the following

Chairman : Dr. Abdul Ghafoor (UNESCO)

Member : Dr. J.P.Gupta (India)
Dr. Mohd. Ismail Yaziz (Malaysia)
Dr. Salihan Siahs (Malaysia)
Dr. Anhar Suki (Malaysia)
Mr. Abdul Wahid Ghazali (Malaysia)
Dr. Porferio L. Basilio (Philippines)
Dr. A.K.Gunapala (Sri Lanka)

6. UNESCO Secretariat

Dr. Abdul Ghafoor, Programme Specialist in Environmental Education, UNESCO, Paris.

7. The Opening and Closing Session

(a) Opening Session:

About 60 people from various public and private organizations attended the opening ceremony of the workshop. The Acting Dean of the Faculty of Science and Environmental Studies, Dr. Salihan Siahs, presented a welcoming speech in which he thanked UNESCO for its support in organizing the workshop and also the local and overseas participants for their commitment in the preparation of country reports and for their efforts in the critical review of the chapters of the sourcebook in Non-Formal Environmental Education.

The representative of UNESCO, Dr. Abdul Ghafoor, welcomed the audience on behalf of UNESCO. He said that the Subregional Training Workshop on Non-Formal Environmental Education for Asia was organized by Universiti Pertanian Malaysia in cooperation with UNESCO-UNEP International Environmental Education Programme (IEEP) in the framework of UNESCO's Programme and Budget for 1984-1985 as an activity of IEEP. He added that the objectives of the workshop are to familiarize participants with the contents of a Sourcebook in Non-Formal Environmental Education prepared by IEEP, to study possibilities for its local adaptation and to foster exchange of information and experience among the Member States in this field.

On behalf of UNESCO, Dr. Abdul Ghafoor thanked the Government of Malaysia for facilitating the organization of the workshop in the naturally and socio-culturally rich and hospitable environment of Malaysia. He expressed his thanks to Universiti Pertanian Malaysia especially its Faculty of Science and Environmental Studies for organizing the workshop in cooperation with IEEP. He also thanked the governments of Member States that had sent their participants to the workshop. Dr. Abdul Ghafoor expressed hope that the results of the workshop will have a multiplier effect in the participating countries for enriching the non-formal education activities and projects with respect to environmental concern, awareness, understanding, knowledge, skills and attitudes which could lead to the improvement of the environment and its quality and to the solution and prevention of environmental problems by the general public.

The workshop was officiated by the Vice-Chancellor of the Universiti Pertanian Malaysia (UPM), Professor Dato' Dr. Nayan Ariffin. In his speech, he brought to note that this was the second time that UPM has organized a workshop on EE and hoped that more activities in EE can be held in UPM, since the topic coincides with the interests of the University. Indeed UPM is the only University in Malaysia which offer an integrated undergraduate programme at B. Sc. in Environmental Science. The Vice-Chancellor also highlighted on the importance of EE, both, formal and non-formal in the maintainance of environmental

quality in collaboration with other measures such as legislation, training, and research. Professor Dato' Dr. Nayan also specially singled out the importance of developing ethical considerations in environmental quality management. He further added that EE should aim to avoid despair and create a positive attitude in judgements pertaining to environmental quality control.

(b) Closing Session

The closing ceremony of the workshop was officiated by the Deputy Dean of the Faculty of Science and Environmental Studies in U.P.M. , Dr. Salihan bin Siahs .

In his speech, Dr. Salihan expressed his satisfaction over the indepth discussions and exchange of ideas which had transpired between the participants in the workshop over the sourcebook in Non-Formal Environmental Education . He also stressed on the importance of coordinated efforts in the promotion of Environmental Education and also the free-flow of information for Environmental Education . Lastly , Dr. Salihan declared his fervent hope that each participant will work resolutely for the advancement of Non-Formal Environmental Education in their respective countries and to quote him , " The future of our earth as an environmentally pleasant habitat is reward enough to make it worth our efforts " .

8. Proceedings

In the morning of 18 November 1985 the opening session of the Subregional Training Workshop on Non-formal Environmental Education was chaired by Dr. Salihan Siais, acting Dean of the Faculty of Science and Environmental Studies who welcomed the participants, observers and guests. Dr. A. Ghafoor welcomed the audience on behalf of UNESCO. The workshop was officially opened by Professor Dato' Dr. Nayan bin Ariffin, the Vice-Chancellor of Universiti Pertanian Malaysia. In the opening address (see Annex III) he welcomed the participants and observers of the workshop.

After the opening ceremony, the workshop went into session under the Chairmanship of the Acting Dean of the Faculty of Science and Environmental Studies and elected its Bureau Dr. Mohd. Ismail Yaziz chaired the session of the workshop and Dr. Abdul Ghafoor, Programme Specialist, UNESCO, Paris explained the work of the workshop. This was followed by presentation of country reports by Dr. J.P. Gupta (India), Mr. H. M. Soeharto (Indonesia), Dr. Kiew Bong Heang (Malaysia in personal capacity). The session was followed by open forum.

In the afternoon session chaired by Dr. Mohd. Ismail Yaziz, presentation of country reports continued by Dr. Porferio L. Basilio (Philippines), Mr. A.K. Gunapala (Sri Lanka), Dr. Cherdasak Choomnoom (Thailand). It was followed by discussion. Then Dr. Abdul Ghafoor, UNESCO representative, made a presentation on UNESCO - UNEP International Environmental Education Programme and spelled out its activities for the period 1986-1987. This was followed by discussion.

The morning session of 19 November 1985 was chaired by Dr. Mohd. Ismail Yaziz. Dr. Abdul Ghafoor presented a paper entitled Overview of Non-formal Environmental Education which was based on Chapters 1 and 2 of the sourcebook. Miss Zelina Zaiton Ibrahim presented the resume of Chapter 3 entitled "The Environment". Suggestions for improvement of the chapter were received through discussion.

The afternoon session was chaired by Dr. J.P. Gupta and resume of Chapter 4 entitled "Environmental Problems" was presented by Ir. Gurmit Singh. The presentation was followed by discussion during which comments on the chapter were received.

In the morning of 20 November 1985 the workshop was chaired by Dr. Mohd. Ismail Yaziz. Dr. Abu Bakar Jaafar presented resume of Chapter 5 entitled Natural Resources. It was followed by a discussion with comments on the chapter.

The afternoon session was chaired by Dr. J.P. Gupta. Resume of Chapter 6 entitled Energy and Its Uses was presented by Mr. Lee Choong Loui. This was followed by discussion which produced comments on the contents of the chapter.

In the morning of 21 November 1985 the workshop was chaired by Dr. Mohd Ismail Yaziz. Chapter 7 entitled "Development" was presented and discussed by Miss Chee Yoke Ling, and discussion session followed the presentation which provided comments on the chapter.

The afternoon session was chaired by Dr. J.P. Gupta while Dr. Mohd. Ismail Yaziz presented Chapter 8 entitled "Environmental Ethics". The presentation was followed by discussion which provided comments on the chapter. Suggestion for the use and local adaptation of the sourcebook were discussed late in the afternoon.

In the morning of 22 November 1985 under the chairmanship of Dr. Mohd. Ismail Yaziz a presentation on formal environmental education in Malaysia was made by staff member from the Curriculum Development Centre of the Ministry of Education. Following this, participants to the Subregional Training Workshop on Non-formal Environmental Education for Asia studied the draft final report and requested UPM and IEEP to edit the report for style, language and needed changes after which it could be printed as final version.

The closing session of the workshop was held in the afternoon of 22 November 1985. It was chaired by Dr. Mohd Ismail Yaziz. Dr. Abdul Ghafoor thanked the Organizing Committee, the Bureau of the Workshop, the participants, observers and the administrative support staff of the Faculty of Science and Environmental Studies for their serious work in concluding the workshop. The workshop was officially declared closed by Dr. Salihan Siahs, Acting Dean of Faculty of Science and Environmental Studies.

9. Acknowledgement

The participants wish to place on record their appreciation of the services rendered by those who were responsible for making the seminar a success.

We thank the Government of Malaysia for kindly granting permission to hold the workshop. The Vice-Chancellor of the Universiti Pertanian Malaysia has given all assistance in organizing it and he has been very generous in making the facilities of the university available to us. The Department of Environmental Science at the Universiti Pertanian Malaysia has handled the difficult task of organizing the workshop to the entire satisfaction of all participants.

We are most grateful to UNESCO for making the necessary funds available and giving necessary advice and guidance in holding the workshop.

II. INTERGRATED SUMMARY OF COUNTRY REPORTS AND THEIR DISCUSSIONS*

General Information

The concern for environment is evident in all countries represented at the workshop. This concern is reflected in the effort made by both governmental and non-governmental organizations to promote non-formal education on environmental issues. The need for improvement in this area of work both in respect of content and methods is felt.

There are similarities in social cultural and historical backgrounds of the countries under discussion. Historically they have all passed through periods of ancient civilization remembered with pride by the people but their present status described as developing countries implies that they are all passing through a period of social political and economic changes aimed at a better standard of living.

There is population pressure in all countries. However, in Malaysia the official government view is that the resource base is adequate to carry a larger population.

India has the largest population (685 million in 1981), followed by Indonesia with 150.9 million (1983), Philippines with 55 million (1983), Thailand with 47 million (1981), Sri Lanka with 16 million and Malaysia with 15.66 million (1985). The population growth rate ranges from 2.4 % to 3.2% per annum. India has the largest percentage of illiteracy 64% compared to other countries like the Philippines (7.5 %), Indonesia, Malaysia, Thailand and Sri Lanka where the illiteracy rate is about 10% or less.

All participating countries are predominantly agricultural. Rice is the staple diet in all these countries and the cultivation practices are still subsistence oriented. The inroads of modernization came with the establishment of plantation agriculture over one century ago. Intensive industrialization policies are pursued in earnest particularly during the last few decades.

* This is the resume of the country reports of India, Malaysia, Thailand, Philippines and Indonesia, presented at the workshop. The report for Malaysia was presented by Dr. Kiew Bong Heang which reflects his personal views rather than that of the government.

Environmental Problems In Participating Countries.

The countries are characterised with environmental problems caused by poverty and also by over exploitation of the resource base. The presently observed environmental problems can be summarised as follows :

- (a) Deforestation caused by opening of forest for cultivation, timber extraction and shifting cultivation
- (b) Soil erosion due to lack of soil conservation measures in agriculture and deforestation.
- (c) Improper use of pesticides in agriculture.
- (d) Water pollution by pesticides and industrial waste.
- (e) Improper solid waste disposal by industries.
- (f) Growth of slums and over population in cities.
- (g) Presence of noise and air pollution due to vehicular traffic in cities.
- (h) Health and sanitation and nutrition problems.

Measures Taken

Both government and non governmental organizations are active in promoting maximum possible measures for environmental conservation, but it is readily admitted that there is a long way to go before desirable levels are reached.

The extent to which each country may have proceeded on these lines may not be the same but the following lines of action are visible in all countries under discussion.

- (a) Strengthening of the legal base for pollution control. Several environmental laws have been passed in Sri Lanka and India after 1980, and in the Philippines in 1976.
- (b) Conservation measures for resources like forestry and wild life (India, Philippines and Malaysia)
- (c) Research on pollution related problems like waste disposal (India, Philippines and Malaysia)
- (d) Reforestation and increase of tree cover. Mention may be made here of social forestry projects in India and Sri Lanka and fuel wood plantation project in Sri Lanka and

the Philippines. In India a Central Wasteland Board has been constituted to afforest 5 million hectares of wasteland each year.

- (e) Environmental Impact Assessment is made compulsory in Sri Lanka, India, Malaysia and the Philippines before any project is launched.
- (f) Environmental education through formal and non-formal education channels is practised in many countries. The Indian Ministry of Education, has issued instructions to all educational institutions to incorporate environmental issues in the curricula and materials for primary, secondary, tertiary, adult and non-formal education.

Current Non-formal Environmental Education Programmes

Both governmental and non-governmental organizations are active in the field of non-formal education. Use of mass media as an effective instrument in reaching the population at large is common in all participating countries. There was evidence however that Malaysia relies on the use of TV to a greater extent than other countries due to the availability of TV among large segment of the population. The other countries pay greater attention to radio as a more widely used medium. Reference was often made to the newspaper as a frequently used medium. Periodicals and pamphlets are also being produced.

Seminars, talks and exhibitions are used in all participating countries. Special mention is made of a series of seminars in Sri Lanka covering all administration districts where all important public officials are participating.

The Sri Lanka participant referred to a special programme in Sri Lanka called the '100 million trees programme' and the involvement of school children in environment by forming pioneer brigades committed to environmental improvement by a special oath.

The incorporation of environmental education to the adult education programme in India has a special significance as the country has launched a well layed out adult education programme. The use of traditional media of communication like puppet plays and dance drama to convey the environmental message is receiving emphasis in India.

Future Plans

India is planning a special programme of environmental education orientation for planners and decision makers. They propose to launch refresher courses, workshops, lectures and

multimedia campaigns. The proposed Centre of Excellence in Environmental Education is expected to upgrade all materials and methods now in use.

In Sri Lanka attention has been directed to a study of awareness as guide to future work. There are also plans for closer collaboration with formal education streams. A series of 2 minutes video films is planned with a view to showing them in between longer TV programmes. A newsletter would be issued regularly.

In Thailand the hill areas are receiving special attention because poor people are living in these areas and several environmental problems like deforestation and fuel wood shortage are observed there. The establishment of a Public Park to honour Her Royal Highness the Princess Mother is expected to generate an interest in environment conservation.

The Thai Government through her agency, The Department of Non-Formal Education, has organised a task force to take responsibility for the development of strategy and appropriate methods in the implementation of non-formal environmental education.

In Malaysia, the non-formal environmental education will focus on the following: education of officers in non-formal environmental education, production of more audio-visual packages such as slide packages and video tapes on the environment which will be made available to schools and the public on loan, more articles on the local environment written for the press and magazines, the establishment of a centre for the development of more materials related to the local situation to which the public can relate to rather than relying on foreign materials and to provide materials in the national language of the country.

In the Philippines non-formal environmental education will focus on strengthening institutional linkages to carry out programs more effectively and development of programs designed to 1) enhance greater environmental awareness, 2) greater participation in energy conservation and environmental sanitation, and 3) production of learning materials in printed form.

The Indonesian government has a programme to make non-formal environmental education as part and parcel of the national education sub-system. The government, through various agencies, helps the target groups by explaining to them the importance of health care, family planning, saving plans, and other activities which has a bearing on the awareness of environmental degradation, and problems that may affect their livelihood.

Suggested Priorities

The Sri Lankan participant suggested that the priorities should be given to include the following topics in the implementation and development of the non-formal environmental education programme: Deforestation, soil erosion, water pollution, industrial pollution and problem of solid waste management. In addition emphasis will be given to harmful effect of pesticides and excessive use of water for cultivation. Apart from the awareness campaigns through the various governmental agencies the mass media would be extensively used.

The Indian government has planned to established a Centre of Excellence in Environmental Education, which will prepare basic educational reference materials, develop environmental education and awareness programmes, provide services to other environmental education agencies, devise field test programmes, develop interpretative centres, train people in carrying out the programmes, initiate and propagate the programmes, develop a reference library and a data centre, and publish a Quarterly Journal for general environmental education for professionals and others in the field. Also there was an effort to establish linkage among non-formal Adult Education, Adult Literacy programmes including women's literacy on environmental factors and action.

In view of the public interest and demand for information, the Malaysian participant is of the view that steps should be taken to facilitate the development of environmental education materials through non-governmental organisations and other interested parties. The government can play a major role by establishing co-curricular activities in schools in promoting environmental awareness and education to students. The existing environmental groups should be harnessed to enhance non-formal environmental education.

In line with the economic stabilization program of the Philippines government, interest is placed more in helping rural folks (farmers and labourers) in attaining self-sufficiency in their basic necessities namely food, clothing, shelter, and in enhancing ecological balance.

The Indonesian government prefers to promote the Village Committee Institution (LKMD) in promoting non-formal environmental education to the masses. The technique includes the transfer of knowledge from key persons to informal and formal leaders, and then to learning group organizations at the villages.

Conclusion

A great deal of programs and strategies have been organised and adopted to boost non-formal environmental education both by governmental and non-governmental institutions. However, since the nature of the environmental issues are constantly changing strategies and methods must be constantly reviewed and revised to suit changing circumstances.

III. PRESENTATION ON UNESCO-UNEP INTERNATIONAL ENVIRONMENTAL EDUCATION PROGRAMME (IEEP)

By: Dr. Abdul Ghafoor, Programme Specialist in
Environmental Education, UNESCO, Paris.

BACKGROUND

Recommendation 96 of the United Nations Conference on Human Environment, Stockholm, stated that "the Secretary-General, the organizations of the United Nations system, especially the United Nations Educational, Scientific and Cultural Organization, and the other international agencies concerned, should, after consultation and agreement, take the necessary steps to establish an international programme in environmental education, interdisciplinary in approach, in school and out of school, encompassing all levels of education and directed towards the general public, in particular the ordinary citizen living in rural and urban areas, youth and adults alike, with a view to educating him as to the simple steps he might take, within his means, to manage and control his environment". Responding to the above Recommendation, UNESCO and UNEP in 1975 launched the UNESCO-UNEP International Environmental Education Programme (IEEP) to promote reflection, action and international cooperation in this field.

Goals

1. Long-term goals

The general objective of IEEP is to promote implementation of the Recommendations of the Tbilisi Intergovernmental Conference on Environmental Education (1977) through encouraging and assisting governments, national, regional and international institutions to incorporate environmental education into formal and non-formal educational systems and programmes in order to make people aware of the nature of the relationship between man and the environment; impart knowledge and skills to understand the environment and development related problems; and enable people to acquire attitudes and motivations leading to sound decisions and actions for the protection and improvement of the environment and its quality.

2. Short-term goals

The immediate concern of IEEP as short-term goals is to encourage and assist Member States, national, regional, and international institutions to develop the manpower and

educational resources necessary for teaching environmental education at the primary and secondary school and university levels, technical and vocation education and education of the general public, and to promote local adaptation and use of environmental education materials developed under the IEEP.

Results

The results of the IEEP in the last ten years may be summarized as the following: a) the development of a general awareness of the necessity of environmental education b) the development of concepts and methodological approaches in this field; and c) initiating efforts to incorporate an environmental education dimension into the education processes of Member States.

Activities

The following activities undertaken at international, regional, sub-regional and national levels lead to the above mentioned results. These activities are grouped under Exchange of Information, Development of Environmental Education Goals, Objectives, Guiding Principles and Concepts, Research and Experimentation, Training of Personnel and International Cooperation.

1) Exchange Information

Exchange of information and experience in environmental education has been an essential activity of IEEP for disseminating information and materials on environmental education development. This activity has been fostered through the publication and dissemination of the quarterly newsletter "Connect" in five languages to about 13,000 professionals and institutions. Similarly, directories on institutions and environmental education programmes as well as a glossary of environmental education terms have been prepared and disseminated. Documents such as Trends in Environmental Education, numerous reports of environmental education meetings organized under IEEP, copies of environmental education documents prepared in the Environmental Education Series of IEEP have been distributed free of charge to interested institutions and professionals and to participants of all meetings organized under IEEP. Furthermore, in all training workshops and seminar organized by the IEEP, participants have been requested to prepare and present country reports, as done in this workshop, on the development of environmental education in their respective countries. Resumes of these country reports are reflected in "Connect" for informing a wider audience on the development of environmental education in the participating Member States.

2. Development of Environmental Education Goals, Objectives, Guiding Principles and Concepts

Environmental education as a process for imparting awareness, knowledge, skills, attitudes, commitments and actions to its target groups in the formal and non-formal education has needed agreed upon goals, objectives, guiding principles and concepts for serving as a base for curriculum and materials development, teacher training, teaching methodologies and evaluation. IEEP has fostered the development of the above elements through the organization of an International Workshop on Environmental Education in 1975 in Belgrade, Regional Expert Meetings in Africa, Asia, Latin America and the Caribbean, Arab States and Europe during 1976-1977, and the Intergovernmental Conference in Environmental Education, Tbilisi, USSR, October 1977. A concrete outcome which could be considered a land mark in the development of environmental education in the 70s was the formulation of environmental education goals, objectives and guiding principles at the Tbilisi Conference which has served as a common ground for almost all international undertakings and most national activities in environmental education.

Under the umbrella of the environmental education goals, objectives and guiding principles, strategies for curriculum development and teacher training, guidelines for developing non-formal environmental education, process for preservice teacher training, sourcebooks for formal and non-formal environmental education, and 21 documents under the Environmental Education Series have been developed. These have lead to the development of environmental education concepts, methods and evaluation.

3. Research and Experimentation

Teaching materials and activities in formal and non-formal education that need more local orientation and adaptation are those that relate to the physical, biological and socio-cultural aspects of the environment. Furthermore, there is need to find out if such environmental relevance and adaptation foster awareness and teaching and learning of environmental concepts and the development of attitudes, commitments and actions required for the conservation and improvement of the environment among the target groups of formal and non-formal environmental education. Similarly, the formative and summative evaluation of environmental education projects as a whole are to be research based. Thus the need for research and experimentation to assure the environmental relevance of teaching/learning materials and activities in the fulfillment of environmental education objectives.

IEEP's research and experimentation activities, for example, have involved international survey of environmental education needs and priorities; surveys on curriculum development and teacher training in environmental education; survey and studies on the incorporation of environmental education into university general education; studies on the development of guidelines for

the incorporation of environmental education into non-formal education and into technical and vocational education; research on the development of interdisciplinary content and methods for the incorporation of environmental dimension into general education in polytechnical schools and into biology and geography and into civic education. Furthermore IEEP has supported the local adaptation of selected environmental education documents at national level. In general, the impact of the implementation of pilot projects in environmental education is long-lasting because involves local educators for 2 to 3 years to find out about their priority needs in environmental education and accordingly design and experiment materials and methods that would suit their environmental conditions and fit their educational systems. Such activities, one can assume, ought to lead to further environmental education development at national level.

4) Training of personnel

As the current workshop is concerned with training in non-formal environmental education, it may be relevant to elaborate in some detail the training activities of IEEP. Educational personnel, especially key persons and teachers, are the backbone of educational undertakings for effective planning and implementation. Environmental education is a new educational dimension with an interdisciplinary nature. Environmental education cuts across all subjects horizontally in one level and vertically at different levels. Furthermore, environmental education advocates problem-solving approach in its teaching/learning. Achieving the above requires well oriented educational personnel for the planning of environmental education in the context of overall educational system, the incorporation of environmental education into the existing curriculum and into the preservice and inservice teacher training programmes. Such needed orientation requires intensive training and retraining of the educational personnel through preservice and inservice training programmes. The training of personnel in environmental education was identified as a priority need in the International Survey of Environmental Education Needs and Priorities done in 86 Member States in 1976. The Intergovernmental Conference on Environmental Education in Tbilisi (1977) emphasized the training of personnel through recommendations Nos 17 and 18 addressed to Member States as the following:

- Environmental science and environmental education be included in curricula for preservice teacher education;
- the staff of teacher education institutions be assisted in this respect;
- teachers should get appropriate environmental training relating to the area, either urban or rural, where they are going to work;
- they take necessary steps to make in service training of

teachers in environmental education available for all who need it;

- the implementation and development of inservice training, including practical training, in environmental education be made in close cooperation with professional organizations of teachers, both at international and national levels;
- inservice training take account of the area, either urban or rural, where the teachers are working.

The Conference further recommended to UNESCO to promote the dissemination of ideas, programmes and instructional material relevant to the promotion of inservice training in environmental education.

IEEP has followed the following strategies in the training of personnel in environmental education:

- a) To involve professionals and institutions in the preparation of training materials in Environmental Education

Two working documents on strategies for curriculum development and teacher training in environmental education in Africa were prepared by two staff members of the Kenya Institute of Education for the Regional Training Workshop in Environmental Education for Africa organized in Dakar, Senegal, from 11-20 December 1978. The two writers were also invited to serve as consultants in the workshop. The two authors were taken through the whole process of the preparation and organization of the training workshop. Similarly, two educators from the School of Education of University of the West Indies, in Jamaica, were commissioned to prepare two working papers on strategies for curriculum development and teacher training in environmental education for the Caribbean. They were invited to serve as consultants during the Sub-regional Training Workshop in Environmental Education for the Caribbean organized from 9-20 June 1980 in Antigua. The same exercise was repeated with one consultant in the Training Workshop for Latin America organized from 29 October to 7 November 1979 in San Jose, Costa Rica. The same was done in the Sub-regional Workshop on Teacher Training in Environmental Education for Europe organized in Czechoslovakia, from 13-17 October, 1980 in the Regional Training Workshop in Environmental Education for Asia, Bangkok, in 1980, in the Regional Training Workshop of Europe, Essen, DGR, in 1980, and in the International Training Course on Environmental Education, Czechoslovakia, in 1982.

Similarly, for the preparation of six modules on preservice and inservice training of primary and secondary science and social science teachers, teams of educators were engaged from (i) The School of Education of the University of West Indies in Jamaica and from the Curriculum Department of the Ministry of Education of Jamaica, (ii) The Science Centre of the University of the Philippines, (iii) Faculty of Education of Monash

University and The South Australian College of Advanced Education, Australia, (iv) National Council of Educational Research and Training, New Delhi, India, and (v) Kenya Science Teachers College, Nairobi, Kenya.

- b) To foster the development of centres of excellence in Environmental Education training

All of the IEEP training activities at international, regional and subregional levels have been institutionalized in certain institutions with potentialities and promises to serve in the long run as centres of excellence in environmental education training activities at national and international levels. The selection of such institutions has been based on the previous activities undertaken. For example, The School of Education of University of West Indies in Jamaica served in the preparation of working documents for the Antigua Environmental Education Training Workshop in 1980, provided consultants for the same workshop, prepared the Environmental Education: Module for Preservice Training of Teachers and Supervisors for Primary Schools. On the basis of the above experience and professional and institutional interest and commitment, the Subregional Workshop on Teacher Training in Environmental Education for the Caribbean was organized from 18-19 July 1983 in the same university. Similarly, the National Council of Educational Research and Training (NCERT), New Delhi, has served in the implementation of two environmental education projects, has prepared the two documents, Environmental Education: Module for Inservice Training of Teachers and Supervisors for Primary Schools, and Environmental Education: Module for Preservice Training of Social Science Teachers and Supervisors for Secondary Schools. Thus, the Subregional Workshop on Teacher Training in Environmental Education for Asia was organized at NCERT from 3-16 March 1983. In the same way, Environmental Education: Module for Inservice Training of Social Science Teachers and Supervisors for Secondary Schools was prepared at Kenya Science Teachers College (KSTC), and thus the Subregional Workshop on Teacher Training in Environmental Education for East Africa is scheduled to be organized at Kenya Science Teachers College in April 1986. The International Training Course on Environmental Education was organized in Czechoslovakia from 1-28 September 1982 on the basis of earlier experience and input in the implementation of a pilot project in environmental education and the Subregional Workshop on Teacher Training in Environmental Education for Europe, 13-17 October 1980. Similarly, two chapters of the Sourcebook in Non-formal Environmental Education were written at the Faculty of Science and Environmental Studies of Universiti Pertanian Malaysia in Malaysia and that is the major reason for having the Subregional Training Workshop on Non-formal Environmental Education organized by the same Faculty.

The institutionalization of training activities such as the above mobilizes the already gained experience of the concerned institution and its professionals in the service of other Member State and enhances commitment in the further development of

environmental education in the same institution. Furthermore, implementing training activities such as the above will take at least a year for preparation, implementation, and printing and dissemination of final reports, etc. In this process numerous professionals of the concerned institution get involved in the preparation of documents, and their presentation at the meeting/seminar/workshop. Other attend the meeting and get orientation on development of environmental education. In the final analysis, the preparation and organization of training activities such as the above provide opportunities for the development of institutional and professional responsibilities, and competencies in the development of environmental education. It is envisaged that such committed educational institutions may become as centres of excellence for training and curriculum development in formal and nonformal environmental education.

- c) To orient key education personnel towards environmental education philosophy, goals, objectives, guiding principles and strategies for its development

IEEP's training activities in environmental education at international, regional, subregional and national levels have focused on key personnel such as curriculum developers, teacher educators, educational planners, educational administrators and supervisors as well as on personnel in rural development and adult education projects for the purpose of their orientation for a better understanding of the philosophy, goals and objectives of environmental education as well as becoming familiar with strategies needed for environmental education development for primary and secondary schools, for preservice and inservice teachers training and for its incorporation into nonformal education.

It is in this context that an international training course, 5 regional and 5 subregional training seminars as well as national training workshops in 37 Member States have been organized by IEEP.

- d) To enhance networking in Environmental Education training

IEEP enhances exchange of information and experience in environmental education through the dissemination of "Connect", distribution of documents and meetings as mentioned earlier. Furthermore, with respect to training in environmental education, there are limited number of institutions, professionals and participants that have been involved in the preparation of training materials and documents and organisation of training activities at international, regional and subregional levels. All training documents and reports are regularly distributed to these institutions and professionals. Furthermore, a number of them are contacted for comments and critiques on drafts of new documents. These institutions and professionals form an environmental education training network.

5) International cooperation

Most of the activities implemented by IEEP have an international cooperation dimension. Specifically, international cooperation has been enhanced through fielding advisory missions concerning environmental education training activities, curriculum development and pilot projects. Similarly, nine environmental education regional and international meetings and conferences organized by governmental and non-governmental organisations have been supported by IEEP.

DISCUSSION

In general, the questions asked related to the structure of the environmental education programme in UNESCO, funding policies for environmental education and on the interaction between UNESCO and private voluntary organizations.

In answering the questions, it was pointed out that the UNESCO-UNEP International Environmental Education Programme is housed in the Division of Science, Technical and Environmental Education of the Education Sector in UNESCO, Paris. Previously, advisors on environmental education were available in four regional offices but because of the lack of funds these posts were relinquished. The task of environmental education has since been given to existing programme specialists in the regional offices.

Concerning enquiry about financial support from UNESCO to an institution that wished to organize an environmental education workshop or course, it was pointed out that an early application would have to be submitted to UNESCO through the official channels of the concerned country. So far, UNESCO has supported 31 pilot projects, 37 national training workshops and 12 conferences and seminars in different parts of the world.

A comment was made by a participant, about the lack of direct interaction, in terms of real activity, between voluntary organizations or non-governmental organizations (NGOs) and UNESCO as UNESCO usually responds to request from governments only. It was pointed out that IEEP has collaborated with numerous NGOs through the provision of funds and technical documents for their environmental education activities. Examples are the UNESCO Club in Bangladesh, United Schools International in New Delhi and in Bahrain the Nature Society in Australia, the Asian Environment Society, and FUNBEC in Brazil. It was enquired if IEEP would arrange environmental education seminars for media personnel as they play an important role in fostering environmental awareness. The answer given indicated that at the current training workshop it was envisaged that a few of the participants would come from the media sector but none was introduced. It was added further that the need of media personnel is noted and certain training seminars may be envisaged in the future.

IV. PREPARATORY OUTLINE OF THE SOURCEBOOK

The following explains the basic theme, target groups, objectives, preparation schedule and outline of the sourcebook.

(I) The Basic Theme:

Man's relationship with the environment, his dependency on it, his role in conserving and improving the environment and its quality.

(II) Target Group:

The target group of the sourcebook is the key-personnel (in non-formal education, rural development, mass-media, health and sanitation, conservation, tourism, industry, politics and planning) who has the possibilities to convey environmental education information and experiences to the general public in the domain of their activities.

(III) Objectives:

A. General:

1. To develop in the target group an awareness and knowledge about the environment, its quality and its problems.
2. To foster in the target group a positive attitude towards the environment and its improvement which could lead to actions and decisions for the conservation and improvement of the environment and its quality.
3. To enhance environmental literacy in the context of life-long education.

B. Specific:

1. To familiarize the target group with the goals and objectives of non-formal environmental education.

2. To help the target group to realize and understand that they are a part of the total environment and their decisions and actions have positive and negative effects on the environment.
3. To enable the target group to realize and understand that human intervention on the environment has already caused and produced environmental changes and they will, thus, be introduced in the global, urban and rural contexts, to environmental problems.
4. To introduce the target group to some very essential and basic environmental knowledge so that they could understand the major processes active in the environment.
5. To acquaint the target group with activities that may help them to initiate environmental actions and education for the control, solution and prevention of environmental problems, and, for the improvement of the environment, and its quality.
6. To help the target group how to educate the general public in environmental education.
7. To enhance the development of environmental ethics and to foster the development and enforcement of environmental legislation.

(IV) Languages:

The original language of the sourcebook will be English, but its level of presentation would be rather simple so that its reading and comprehension should be easy for a large target group with a wide range of schooling background. The use of complicated technical language and chemical formulas and equations will be avoided. The sourcebook will then be translated into French, Spanish, Arabic and Russian.

(V) Illustrations:

In order to make the sourcebook easily understood by its target group, it is envisaged to have it illustrated with pictures, graphs and charts.

(VI) Size:

It is envisaged to limit the size of the sourcebook to about 500 standard pages.

(VII) Preparation Scheme:

As the sourcebook touches many different aspects of the environment, especially from the angles of education, ecology, culture, technology, and development, it would seem appropriate, to utilize the competencies of few institutions in different parts of the world, by having each part of the sourcebook prepared under contract with different institution.

Under this scheme:

- 1) Each institution is provided with the content orientation of the sourcebook and a series of environmental education documents.
- 2) Each institution is to prepare a detailed annotated outline of the relevant chapters which will be shared with all other institutions for avoiding duplication, over-lapping and gaps.
- 3) Each institution is to prepare a first draft of the relevant part of the sourcebook. The first draft will be sent out to all participating institutions and other professionals for comments and critiques. Each institution is then to revise the first draft in the light of the comments.
- 4) All revised parts are, then, to be given to one of the participating institutions for harmony, coordination and editing towards a final draft.

(VIII) Outline of the Sourcebook:

Introduction (5 pages)

1. The need for the sourcebook.
2. The goals and objectives of the sourcebook.
3. The target group of the sourcebook.
4. Suggestions for utilization of the sourcebook.
5. Acknowledgements for the preparation of the different parts of the sourcebook.

PART I: Non-formal Environmental Education (90 pages)

Chapter 1: An overview on non-formal environmental education (30 pages)

- 1.1 Historical background
- 1.2 The need
- 1.3 The concept, objectives, principles and functions of environmental education
- 1.4 Environmental literacy components
- 1.5 The target groups of non-formal environmental education and their characteristics e.g. pre-school children, school and college dropouts; illiterate adults, agricultural, farm, animal husbandry, fishery, forestry, and factory workers, extension agents, health workers, family planning personal, adult education instructors and supervisors; and the physically handicapped, etc.

Chapter 2: Implementation of non-formal environmental education (60 pages)

- 2.1 Legislation
- 2.2 Policies, planning, and management
- 2.3 Organizational framework
- 2.4 Administration
- 2.5 Facilities
 - a. Building
 - b. Transport
- 2.6 Teaching resources and approaches
 - a. Curriculum and teaching-learning materials development
 - b. Planning for instruction
 - c. Teaching methodologies
 - d. Evaluation

2.7 Staffing and their training

Pre-service

In-service

2.8 Coordination of formal and non-formal environmental education for efficiency, economy and success

PART II: Some Basic Knowledge about the Environment (200 pages)

Chapter 3: The environment (150 pages)

3.1 The concept of the environment (30 pages)

The concept of the environment, its totality and holistic nature, along with its natural, social, and cultural dimensions and their interrelationships are to be elaborated. The social, economical, spatial, biological, political, physical, aesthetic, and cultural as well as technological factors, may be considered. In presenting the environment the target group ought to be made aware of all these factors and many others which may be involved in environmental issues, specially when it comes to major decision making, at local, provincial and national level that would result in environmental changes. The basic and essential knowledge provided here is to help the target group to understand the major processes active in the environment, the causes and effects of the existing environmental problems, as well as of their own decisions and actions on the environment.

3.2 Major ecological concepts (60 pages)

1- The concept of ecology

2- Ecosystem organization and functions

- . The concept of ecosystem as an ecological unit
- . Components of an ecosystem
- . Energy flow in an ecosystem
- . Material flow in an ecosystem

After a period of time, they will have enough profit to run on their own. The first fund they received has to be returned to the government which will be given to other Package A learning groups.

Taking note of Indonesian fertile land there should not be any starvation among the people. To fight against malnutrition the government gives extensive training to the nutrition field workers which come from the community. As a follow-up of these activities they will do home-gardening of productive crops.

The health of children under 5 years old is given priority (BALITA). Mothers who participate in PKK, (family welfare education activities), have meetings to discuss how to nurse babies properly, how to cook by using local produce which is inexpensive but rich in vitamins and protein. To reduce population growth, they have to motivate women to practise family planning; that is every family must have a small family. This programme has been implemented with first priority. This programme is supported by food, facilities (building, tools or cars), manpower and fund. This programme is being run through formal and non-formal channels.

To overcome housing problem, people are motivated through the meetings of family welfare educational organization and village community organization. Also, thousands of houses are built by Real Estate or National Housing.

Bare forest, spoilt lands are taken-up by Community Plantation or as we call it PIR (Perkebunan Inti Rakyat). This project will spend a lot of money for replanting oil palm, clover, coffee, rubber and for giving extension to people living in surrounding areas.

Finally, in order to discourage the people from wasting their money on expensive traditional ceremonies, media of religious extension can be used. Eventhough it is difficult because of their belief but we find it to be in progress. The aims could be achieved because of bad economic situation faced by the people.

Flow Of Non-Formal Environmental Education Programme

The environmental problems in Indonesia are not faced by an individual or a certain group only but it seems to be a national problems where everyone has the right, the duty and the competence to have a good and healthy living environment.

Because of the serious problems on environment, the government has issued a policy through laws of Republic of Indonesia No. 14, established in 1982, about the main appointment of environmental control.

Chapter 4: Environmental problems (50 pages)

The chapter will focus on major environmental problems of the contemporary world treating each problem in the global, urban and rural contexts. It is aimed that such presentation would sensitize the target groups and provide them with information and knowledge on environmental problems that affect them in many ways today and in the future. The cause of these problems and their effects on the individual, on the environment will be elaborated. Statements and assertions on environmental problems may be supported by the positive or negative results of actual cases (dams, nuclear power, waste disposal techniques and sites, impacts of chemicals on man, animals, and plants etc.) presented in concise and brief form. In this context the following elements or similar ones may be elaborated:

- 4.1 The nature and scope of environmental problems
- 4.2 The causes of environmental problems in industrialized and developing countries
- 4.3 The present and future impact of environmental problems on ecosystems with human as its integral part
- 4.4 Measures for controlling, solving and preventing environmental problems
- 4.5 Some examples of environmental problems, causes, effects and control:

a) Pollution;

- Air: particulates, engine emission, incineration, industrial emissions, smog, etc.
- Water: (rivers, lakes, seas, oceans): flood control, sedimentation, thermal discharges, soft and solid waste, agricultural run-off, municipal sewage systems, etc.
- Soil:
- Noise: traffic, construction, industrial, etc.
- Visual:
- Radioactive:
- Military (armament)

- b) Environmental problems caused by poverty;
 - i) famine, hunger and malnutrition
 - ii) crowding and insufficient housings
 - iii) depletion of natural resources
 - iv) unemployment
- c) Deforestation;
- d) Desertification;
- e) Natural and man-made disasters
- 4.6 Implications (of the above contents) for the activities and decision of the target group for fulfilling environmental education objectives
- 4.7 Suggested environmental actions and legislation concerning the above subjects

PART III: Environment and Sound Development (130 pages)

Chapter 5: Natural resources (40 pages)

- 5.1 The concept of natural resources (3 pages)
- 5.2 Limitations and finiteness of the resources of earth (3 pages)
- 5.3 Unequal distribution of resources (3 pages)
- 5.4 Renewable resources (soil, water, forests, fishery and wildlife etc.) (5 pages)
- 5.5 Non-renewable resources (minerals, fossil fuels etc. (5 pages)
- 5.6 Use, management, conservation and recycling of resources (15 pages)
- 5.7 Implications for the activities and decisions of the target group (3 pages)
- 5.8 Suggested environmental actions and legislation concerning the above subject (3 pages)

Chapter 6: Energy and its uses (40 pages)

6.1 Energy resources, the backbone of contemporary industrialization (3 pages)

6.2 Sources of energy (15 pages)

- The conventional sources, their lasting possibilities, their impact on the development and the environment of industrialized and developing countries

- . Fossil fuels

- . Nuclear

- . Etc.

- The new and renewable sources of energy and their impacts on the environment

- . Solar

- . Geothermal

- . Wind

- . Etc.

6.3 Energy utilization and conservation (15 pages)

- The energy crisis and its major causes

- The effects of energy crisis on the daily life and development in the industrialized and developing countries

- Effective utilization and conservation of energy and its resources for sound development

6.4 Implications (of the above contents) for the activities and decisions of the target group towards fulfilling environmental education objectives (3 pages)

6.5 Suggested environmental actions and legislation concerning the above subject (4 pages)

Chapter 7: Development (50 pages)

In view of the current degradation of the environment, its associated problems, and on the basis of the need of the individual and the society for a healthier and better environment, and the concern shown in this regard by governments and the international community, this section is to reflect on environmentally sound development as well as on its practical principles with focus on the short-term developmental objectives. All rounded development ought to be elaborated. Certain successful and unsuccessful environmentally sound development projects or enterprises as concrete case studies may also be presented. In this context the following or similar elements may be elaborated:

- 7.1 The concept of all rounded or sound development (5 pages)
- 7.2 Practical principle of environmentally sound development (10 pages)
- 7.3 Factors in environmentally sound decision making (10 pages)
- 7.4 Production and consumption patterns (5 pages)
- 7.5 Development and environment compatibility in the light of short and long-term objectives (10 pages)
- 7.6 Implications of the above contents for the activities and decisions of the target group towards achieving environmental education objectives (5 pages)
- 7.7 Suggested environmental actions and legislation concerning the above subject (5 pages)

Chapter IV: Environmental Ethics (50 pages)

Chapter 8: Environmental ethics

- 8.1 This part will focus on the humanity and environment relationship in the context of certain cultures, and historical accounts. It would be brought out that although in the past there were not too many humans on earth and that they did not possess the strong power of science and technology to interfere in the balance of the environment, and that they did not

have an expensive lifestyle to have caused extraction from the environment and its resources, and to have caused lasting environmental problem but still humanity through long experiences and careful observations, had discovered and established that they belonged to the environment and depended on it. They had further found out that this relationship was an intricate and delicate one and thus, they had reflected it in many forms in cultural values, as well as reflected it in historical accounts and even in the literatures of many societies throughout the history.

Humanity's relationship to the environment and the care and improvement of the environment not only need to be revived from many angles, but it has now to be deeper and better understood by contemporary humanity in terms of their number, their power for changing the environment and their high living standards which is a strong motive for extracting heavily from the resources of the environment which are finite. Contemporary humanity must establish their values based on their close relationship and dependence to the environment and on the sound development of the environment.

In other words, in the light of the environmental realities of today, some ethical codes concerning the environment ought to be inculcated in the individual with its base in the family, culture, and education. Perhaps certain environmental ethics may be identified in certain cultures, and pieces of literature from around the world and they could be revived with better recognition. Certain codes of ethics for the different issues presented in this sourcebook may be developed, so that they become appealing to the individual, and the family and their practice would integrate them in the culture. In short, sound environmental ethics ought to be formulated and environmental education ought to foster its development in a society. To establish functional environmental ethics in the individual, will take long time, but after it is formed, it could last long as a strong foundation for the preservation and improvement of the environment.

In this context the following elements and similar ones may be elaborated:

- 8.1 The concept of and the need for environmental ethics
- 8.2 Environmental ethics in historical and cultural contexts

- 8.3 Strategies for the revival, renewal, and development of environmental ethics and its inculcation in the individual, family, and society
- 8.4 Suggested examples of environmental ethics in the context of today's environment, its problems, and development
- 8.5 Implications (of the above contents) for the activities and decisions of the target group for fulfilling environmental education objectives
- 8.6 Suggested environmental actions and legislation concerning environmental ethics.

APPENDIX I: Annotated Glossary (15 pages)

- 1. An annotated glossary environmental education terms is included to facilitate the understanding of environmental education concepts and materials and also facilitate communication and exchange of information in this field.

APPENDIX II: Annotated Bibliography (15 pages)

- 1. An annotated bibliography will be added which is to provide possibilities for further reading and exploration in environmental education and non-formal education.

V. OVERVIEW OF NON-FORMAL ENVIRONMENTAL EDUCATION

By Dr. Abdul Ghafoor, Programme Specialist

UNESCO, Paris

Introduction

Man is an integral part of the environment. Man and environment have always interacted in moulding each other towards the establishment of a man-environment relationship. Man depends on the environment for his needs, such as water, air, food, energy, shelter, health, etc. In other words, man takes all his needed materials from the environment and, in one form or another, gives them back to the environment.

The long establishment man-environment relationship has to be sustained otherwise its disturbances result into environmental problems which are, in the final analysis, man's problems. Man's use of energy and technology and his unsatiable material desire for the excessive use of the finite natural resources of the earth as the long home for humanity have lead to environmental problems at local, national, regional and international levels which need to be solved and prevented ~~in the~~
~~the future~~.

It was in this context that the Declaration of the United Nations Conference on Human Environment organized in Stockholm, Sweden, in 1972 proclaimed: "To defend and improve the environment for present and future generations has become an imperative goal for mankind".

Thus, the need for environmental education as a measure for fulfilling the above goal for mankind.

In order to make the above measure operational, the Conference stated in its Recommendation 96 that an international environmental education programme should evolve after consultation among the concerned bodies in the United Nations System.

It was on the basis of the above Recommendation 96 of the Stockholm Conference that in 1975 UNESCO and UNEP launched the International Environmental Education Programme (IEEP) which is in its tenth year of operation now.

Environmental education had to be defined, its goals and objectives formulated and strategies for its development evolved. It was in this context that in 1977 the first Ministerial Conference on Environmental Education was organized in Tbilisi, USSR.

The Concept of the Environment

With respect to the holistic nature of the environment, Recommendation No. 1 of the Tbilisi Conference states that : whereas it is a fact that biological and physical features constitute the natural basis of the human environment, its ethical, social, cultural and economic dimensions also play their part in determining the lines of approach and the instruments whereby people may understand and make better use of natural resources in satisfying their needs.

It was thus emphasized in Recommendation 7 of the same Conference that Member States refrain from actions that would disfigure the environment or threaten man's life, health or economic conditions; in view of the necessity to conserve the human and cultural heritage as well as distinguished features of civilizations, it was recommended that every effort should be made to preserve these heritages, including the teaching of cultural heritage in environmental education; ... and that the positive and enriching influence of ethical values should be taken into account in developing environmental education programmes.

The Concept, Goals and Objectives of Environmental Education

The Concept of Environmental Education

The Declaration of Tbilisi Conference stated that:

Environmental education should be provided for all ages, at all levels and in both formal and non-formal education. The mass media have a great responsibility to make their immense resources available for this education mission.

Education utilizing the findings of science and technology should play a leading role in creating an awareness and a better understanding of environmental problems. It must foster positive patterns of conduct towards the environment and the nations use of their resources.

Environmental education, properly understood, should constitute a comprehensive lifelong education, one responsive to changes in a rapidly changing world. It should prepare the individual for life through an understanding of the major problems of the contemporary world, and the provision of skills and attributes needed to play a productive role towards improving life and protecting the environment with due regard given to ethical values. By adopting a holistic approach, rooted in a broad interdisciplinary base, it re-creates an overall perspective which acknowledges the fact that natural environment and man-made environment are profoundly interdependent. It helps

reveal the enduring continuity which links the acts of today to the consequences for tomorrow. It demonstrates the interdependencies among national communities and the need for solidarity among all mankind.

Environmental education must look outward to the community. It should involve the individual in an active problem-solving process within the context of specific realities, and it should encourage initiative, a sense of responsibility and commitment to build a better tomorrow.

Recommendation No. 1 of the Tbilisi Conference further stated that:

- A basic aim of environmental education is to succeed in making individuals and communities understand the complex nature of the natural and the built environments resulting from the interaction of their biological, physical, social, economic and cultural aspects, and acquire the knowledge, values, attitudes and practical skills to participate in a responsible and effective way in anticipating and solving environmental problems, and in the management of the quality of the environment.
- A further basic aim of environmental education is clearly to show the economic, political and ecological interdependence of the modern world, in which decisions and actions by the different countries can have international repercussions. Environmental education should, in this regard, help to develop a sense of responsibility and solidarity among countries and regions as the foundation for a new international order which will guarantee the conservation and improvement of the environment.
- Special attention should be paid to understanding the complex relations between socio-economic development and the improvement of the environment.
- For this purpose, environmental education should provide necessary knowledge for interpretation of the complex phenomena that shape the environment, encourage those ethical, economic and aesthetic values which, constituting the basis of self discipline, will further the development of conduct compatible with the preservation and improvement of the environment; it should also provide a wide range of practical skills required in the devising and application of effective solutions to environmental problems.
- To carry out these tasks, environmental education should bring about a closer link between educational processes and real life, building its activities around the environmental problems that are faced by particular communities and focusing analysis on these by means of an interdisciplinary, comprehensive approach which will permit a proper standing of environmental problems.

Goals, Objectives and Guiding Principles of Environmental Education

Perhaps the most outstanding contributions of the Tbilisi Conference was the formulation and endorsement of a set of goals, objectives and guiding principles of environmental education which have served as a common denominator in the development of environmental education at international, regional and national levels. The challenge facing the educational planners, curriculum developers, teacher educators is to adapt and/or adopt these goals, objectives and guiding principles, mentioned in Recommendation 2 and presented below, in terms of their educational systems and levels of schooling and develop the necessary measures such as curriculum and teaching materials for translating these goals into actions.

Goals

- to foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas;
- to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment;
- to create new patterns of behaviour of individuals, groups and society as a whole towards the environment.

Objectives

Awareness: to help social groups and individuals, acquire an awareness and sensitivity to the total environment and its allied problems.

Knowledge: to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of, the environmental and its associated problems.

Attitudes: to help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection.

Skills: to help social groups and individuals acquire the skills for identifying and solving environmental problems.

Participation: to provide social groups and individuals with an opportunity to be actively involved at all levels in working towards resolution of environmental problems.

Guiding Principles - Environmental Education should :

- consider the environment in its totality - natural and built, technological and social (economic, political, cultural- historical, moral, aesthetic);
- be a continuous lifelong process, beginning at the pre-school level and continuing through all formal and non-formal stages;
- be interdisciplinary in its approach, drawing on the specific content of each discipline in making possible a holistic and balanced perspective;
- examine major environmental issues from local, national, regional and international points of view so that students receive insights into environmental conditions in other geographical areas;
- focus on current and potential environmental situations while taking into account the historical perspective;
- promote the value and necessity of local , national and international cooperation in the prevention and solution of environmental problems;
- explicitly consider environmental-aspects in plans for development and growth;
- enable learners to have a role in planning their learning experiences and provide an opportunity for making decisions and accepting their consequences;
- relate environmental sensitivity, knowledge problem-solving skills and values clarification to every age, but with special emphasis on environmental sensitivity to the learner's own community in early years;
- help learners discover the symptoms and real causes of environmental problems;
- emphasize the complexity of environmental problems and thus the need to develop critical thinking and problem-solving skills;
- utilize diverse learning environments and broad array of educational approaches to teaching/learning about and from the environment with due stress on practical activities and first- hand experience.

Target Groups for Environmental Education

Target groups for environmental education were also

identified in Recommendation No. 8 of the Tbilisi Conference as the following :

- The general public : Environmental education should be provided at every age and at all levels of formal education, for pupils and teachers, and in the various non-formal education activities for young people and adults, including the handicapped. In this education, voluntary organizations may play an important role;
- Specific Occupational or Social Groups: Environmental education is focused on those whose activity and influence have an important bearing on the environment, for instance, engineers, administrators and planners, industrialists, trade unionists, policy-makers and agriculturalists. Various levels in formal and non-formal education should contribute to this training;
- Certain professionals and scientists : training is focused on those working on specific problems of the environment, such as biologists, ecologists, hydrologists, toxicologists, soil scientists, agronomists, foresters, landscape architects, oceanographers, limnologists, meteorologists and sanitary engineers. It is important that the training of a scientists include an interdisciplinary component.

Some Differences Between Formal and Nonformal Environmental Education

Common to both, formal and non-formal environmental education, are the goals, objectives and guiding principles. Both aspects of environmental education, formal and non-formal, endeavor to create awareness, impart knowledge and skill and foster attitude changes with respect to the improvement and the solution and prevention of its problems. However, there are certain elements as the following which could serve as examples, that differentiate one from the other.

Target Groups and their Whereabouts

The target groups for formal environmental education are in general the school and university students, who in most cases are found in identified places such as classrooms. In non-formal environmental education the target groups are the adults as well as students who are not found in regular classrooms. Nonformal environmental education has a much larger target audience who are found at home, offices, factories, shops, streets, and on the farms in the rural and urban areas. The target groups and their whereabouts are one of the most important determining factor in controlling the nature of the environmental education message and the methods and means of its presentation.

Educational contexts and materials

In formal environmental education, the school curriculum and textbooks, teacher training programmes and university courses are concrete contexts in which environmental education dimension may be incorporated. In non-formal environmental education such a regular and concrete context is absent but a variety of programmes exists for environmental education enrichment. These are agricultural programmes for farmers, health and sanitation programmes for the general public, rural development programmes, adult education and literacy projects, etc. Such context diversity in non-formal environmental education provides a wide range of possibilities for directing environmental education messages to the general public. If coordinately done, environmental education messages from the different areas mentioned above could reinforce each other and their impact on the general public may have deep and lasting influence.

Methods

In formal environmental education the target groups are found in school and universities where formal education takes place during known days, weeks and months. Methods of teaching used are lectures, discussions, projects, excursions, homework, etc. In non-formal environmental education, since the target groups are scattered in different places, methods of teaching may involve display of posters on the advertising bulletins in a town, factory, offices; slide for short film shows in cinemas; short or long environmental messages on television, radios, newspapers, and journals, presentation of environmental problems through cartoons and pictures in newspapers, preparation and dissemination of readers on the environment and its problems for different groups.

Implementation of Non-formal Environmental Education

Earlier it has been stated that non-formal environmental education has a broad context and a diversified target audience of all age groups found indoor and outdoor in the urban and rural areas. This fact makes the process of planning, development, implementation and evaluation of non-formal environmental education a demanding challenge for concerned professionals.

The following elements, among others, may play an important role in the implementation of non-formal environmental education:

Planning, Coordination and Administration

All educational enterprises, whether formal or non-formal, require sound planning from the outset so that there are established objectives and the necessary means for their accomplishment. This means that non-formal environmental education needs good planning and coordination for its development and effective implementation.

In this context environmental education goals and objectives need to be formulated and/or accommodated in the context of non-formal education activities in vogue within an educational system because without clear objectives, non-formal environmental education could be channeled astray and its effectiveness cannot be guaranteed. Further fulfilling environmental education objectives in the context of non-formal education, it is essential to have a practical plan to reflect among other elements its needed budget. This is done by increasing or sharing the existing budget in concerned projects. Similarly, planning should foresee the orientation of teaching personnel, preparation of materials and the utilization of existing channels of communication for dissemination of non-formal environmental education messages and materials to its target groups.

The above tasks cannot be achieved in one shot. They take time and require coordination. This leads to the need for a coordinating mechanism to oversee and coordinate the planning and development of non-formal environmental education in the context of non-formal education activities, for example, the ministries of agriculture, health, mines and industries, education, and non-governmental organizations. Furthermore, the above coordinating mechanism could decide over the fundamental environmental core concepts, themes, issues and/or problems that are the concern of the society as a whole and oversee their permeation into all non-formal education activities referred to above. For example, if one or more environmental problems such as deforestation, soil erosion, drought, pollution is the critical environmental problem, then it could be chosen as a priority item and all concerned non-formal education projects and activities could accommodate them in the context of their programmes and translate them into non-formal environmental education messages for their target audiences.

Core concepts or themes and/or environmental problems mentioned above should reflect priority needs of the concerned country with respect to its environment. Decision on the identification and opting of such core concepts should be based on environmental research and studies. Effective coordination of the permeation of these core concepts into all the non-formal education programmes is key for faster and more effective impact of non-formal environmental education on the general public. In brief, a practical and realistic plan and a coordination mechanism are fundamental for non-formal environmental education development.

The administration of non-formal environmental education has to be achieved through the existing personnel and infrastructure of the concerned non-formal education activity or project. The above suggested strategy is based on the fact that it does not require additional funds and decision-making for creating new posts and appointing new personnel. Furthermore, it increases the commitment of the existing administrative and professional personnel to integrate the administration of non-formal environmental education in their existing administrative structure and its associated tasks.

Training and Personnel

Personnel in this context mean key persons who make policy decisions and those who carry out the teaching through the different channels available in non-formal education.

Key personnel are key to the development of non-formal environmental education. Nonformal environmental education will not go very far without the key personnel's knowledge of the environment and its problems and the needs for their solution and prevention. Key personnel ought to have the needed commitments for making appropriate decisions on the development and implementation of non-formal environmental education. Thus, the need for the orientation and training of key personnel in environmental education. This can be achieved from the outset if environmental education dimension is included in the preservice training of such personnel who generally go through some branches of higher education. This perhaps sounds futuristic because those who are in the decision-making position now, may have not had such an orientation and thus their training requires an alternative approach which is inservice training and orientation. It can be achieved through seminars, workshops and symposium at local and national levels under the guidance of the coordinating body or mechanism referred to earlier.

Key personnel from ministries of health, education, agriculture, mines and industries, environment, media, etc, could be drawn into these national training or consultation seminars and workshops. Participants as key personnel to these seminars should receive appropriate orientation on the state of the environment of the concerned nation. Furthermore, the seminar should involve these key personnel to come to a consensus on national environmental priorities. They should know what environmental problems are to be solved and prevented and be given the responsibility in incorporating them in the context of their projects. Similarly, these seminars provide the occasion to develop common strategies for the implementation of non-formal environmental education.

Teaching personnel in nonformal environmental education are those who prepare and/or convey environmental messages on selected themes to the general public. Teaching personnel in

this case would involve among others the media personnel who prepare and issue programmes with environmental dimension through television, radio, newspapers, magazines. Similarly, teaching personnel in non-formal environmental education involve teachers or trainers in rural development and adult education and literacy projects, training personnel concerning health programmes and agricultural programmes, etc. The above teaching personnel without any doubt need training in environmental education. Their training may involve relevant knowledge about the environment, its problems and environmental quality as well as skills in transforming such knowledge into educational messages and with the ways how to present these messages to the target audiences in their respective fields. This means that the training of personnel ought to be done in the context of their respective fields and activities so that indepth understanding and relevance of environmental dimension to their concerned field could be achieved. The teaching personnel referred to here are, by and large, the most important group concerning environmental matters in a society or country because their efforts affect and influence the decision-making of the general public on almost all environmental issue that they prepare and present. Thus, the need for their training in environmental education through preservice and inservice programmes.

Material Preparation

The strength of non-formal environmental education in materials preparation is the fact that its teaching materials can be accommodated within the teaching materials of already established programmes. Furthermore, supplementary materials can also be developed to elaborate further those environmental concepts or issues that have already been incorporated into the main teaching materials of a project or on new environmental issues that need special attention. These materials can be prepared and disseminated as readers or modules adapted to a particular programmes and its target audience. For example, television, radio and newspapers have programmes on different subjects for adults, housewives, children, farmers, industrialists, etc. Almost every programme has room for accommodating environmental issues of concern to those particular groups. Additional programmes can also be envisaged, prepared and present to each group.

A further strength of non-formal environmental education is that its teaching materials can be diversified. Such materials could be a series of pictures or posters showing saving or conserving water during a dry season, saving energy, avoiding littering the streets and highways, avoiding forest fires, conserving natural resources in general, preventing the spread of microbes, etc. The above or other similar environmental issues can be presented through drama, round table debate, a cartoon, a

video-film, a set of slides, an editorial or an article in a journal or magazine, a reader, a series of pamphlets for certain groups or the general public.

Business communities around the world have done enormous research and have established strategies on how to influence people for certain products such as clothing or food, how to change people's lifestyle and attitudes towards certain economic, political or religious trends. The preparation of non-formal environmental education materials may be based to a large extent on these outcomes and strategies. Thus, it is suggested that concerned projects should study the research and findings of the business communities in this respect and identify and utilize those techniques and strategies that can enhance non-formal environmental education.

Budget

Non-formal environmental education like any other educational activity needs budgetary provisions for research, experimentation, material preparation and personnel training. As non-formal environmental education cuts across all non-formal education undertakings in the areas of agriculture, rural development, public health and sanitation, etc., it would indeed be desirable to consider its budgetary needs during budget formulation in each of the above areas. In other words, the budgetary needs of non-formal environmental education ought to be integrated into the already existing budgetary provisions.

In case budgetary increase for non-formal environmental education is not a possibility, then a priority ought to be made between non-formal environmental education and certain activities with budgetary provisions that are no more first priorities. This could lead to educational renovation and better utilization of available financial and human resources. If all activities in the concerned non-formal education sector are kept as priorities, then another alternative is to share the available financial resources with non-formal environmental education activities.

Budgetary provision is a question of policy and planning and thus it needs to be examined at the outset of planning and coordination of non-formal environmental education.

Evaluation

Education in general imparts knowledge and skills and change of attitudes in its target groups. Evaluation concerns itself with the task of finding out whether educational objectives have been achieved and how to improve the whole process of planning, curriculum and materials preparation, teaching/learning processes and activities, and their management, etc.

Evaluation is essential in all educational activities including non-formal environmental education for feedback and improvement. Nonformal environmental education concerns itself with individual and group attitude changes which take long time to get established. It also signifies that evaluation in non-formal environmental education has to be a continuous process and in consonance with the formation and development of desired attitudes concerning environmental matters.

In non-formal environmental education a baseline study of the environmental awareness, knowledge, understanding and attitudes of the target groups seems to be essential as a reference point for comparison with later changes. This can be achieved by a well prepared questionnaire based on environmental issues that will be the task and concern of non-formal environmental education through the different non-formal education projects mentioned earlier. The questionnaire can be applied on sample groups from the target audience.

Non-formal environmental education impacts may be evaluated through comparison of results of observations done at different intervals. For example, the evaluator could make observation and recording concerning changes in environmental cleanliness of the streets and surroundings of the target groups, changes in littering, beautification of the surroundings through gardening and planting trees and flowers, changes in waste disposal methods of homes as well as industries. Studying the change in policy-makers' sensitivity to environmental matters and their cautions and sound decision in this regard after or over a certain period of time can be a good indicator in evaluating the impact of non-formal environmental education.

It is strongly suggested that study and research should be done on the evaluation techniques and procedures used by the business community whose concern is to change people's lifestyles with respect to the use of certain products. Some could be adapted for non-formal environmental education evaluation as well.

Conclusion

Non-formal environmental education for environmental literacy of the general public with the purpose of improving the environment and its quality for present and future generations is a timely and needed renewal which should be integrated and implemented within current non-formal education programmes.

VI. CHAPTER 3: THE ENVIRONMENT

The following resume of Chapter 3 was presented at the workshop by Ms. Zelina Z. Ibrahim of UPM. Following the above resume a summary of workshop discussion with comments on Chapter 3 are also recorded.

A: RESUME

The Concept of the Environment

In the universe, Earth is the only planet on which we know that life exists. The four physical components which make up the Earth's environment are the atmosphere, the hydrosphere, the lithosphere and the Earth's molten core. The part of Earth where life exists, the biosphere, is mainly limited to the upper few hundred metres of the lithosphere, the Earth's skin of landmass. The physical world that supports life and the processes involved in the flow of energy and material is sometimes called the environment. To many scholars the environment comprises dynamic or ecological systems resulting from interactions between the physical and the biological components. Thus the environment of an object or living organism is the sum of all external forces and influences acting on it. Each ecological system or ecosystem consists of a set of living, biotic, and non-living, abiotic, elements and is influenced by processes which cause change, such as reproduction, mortality, accretion and depletion.

Relationships of Life Forms to their Environment

The environment includes more than what can ordinarily be perceived although interactions between components are continually occurring. In the environment, climate, water, temperature, light, oxygen content and the chemicals present are important factors which affect life forms. In order to survive the biota in an ecosystem must be adapted to the conditions in that environment. Failure to tolerate and adapt to variations or catastrophic changes in environmental and ecosystem conditions, natural or man-induced, would result in the extinction of that organism. The continued survival of the remaining organisms or life-forms are thus closely related to the state of the environment. Various factors (such as climatic change and tectonic activity as examples of major events and dissolved oxygen and nutrient levels as examples of minor events) in the environment may result in ecosystem change.

The effect of the environment on organisms may be expressed in terms of the principle of limiting factors and of tolerance levels. This states that an organism is able to survive in an area provided that all its essential environmental requirements are met and its tolerance limits are not exceeded. The effects of the variation of any one factor on an organism is not easily determined due to the interaction of many other factors and the differing requirements of various geographical strains or ecotypes of a species.

Man and Environment

The environment also has other dimensions. In a social environment an individual interacts with his community. A life environment may be considered as comprising the temporal evolution of an individual's or society's environment. The environment is also considered to be a home for mankind. The built environment is man's creation. The environment can also be considered to be the base for sustenance of human society. Man is mainly concerned with his social environment and its evolution as well as the use he can make of the environment to sustain the society. Changes in society and its built environment affects the psychological, cultural and social dimensions of human lives. In the early stages of human societies, man's demands on his environment were low. However the role of human society in relation to the environment changed with advances in agricultural practices and a concurrent increase in the human population. This resulted in an increasing proportion of the environment being exploited by man.

Major Ecological Concepts

Concepts of Ecology

In 1868 Reiter coined the word oekologie, now ecology, from the Greek oikos for 'house' or 'place to live' for the study of the interactions between organisms in relation to their environment. Although ecology deals mainly with biological functions and interactions of organisms, many other disciplines are interrelated with it. In nature life is dependent on other life and on the physical environment.

Several concepts have evolved to be considered as being fundamental to ecology:

1) Structural and functional units

An ecosystem comprises biotic and abiotic components. The community in an ecosystem is structured from two or more populations of species. Each population of species occupies a

unique functional position or specific niche in the community or functional unit. A group of communities in a geographical location results in a biome.

2) Interrelationships among organisms

The interactions between different species in a community must be analysed before its structure and dynamics can be understood. The network of interactions can be on both inter and intraspecific levels and may exhibit varying degrees of benefit to different organisms. The relationship or symbiosis of two or more organisms living together may be beneficial or not. In commensalism only one partner benefits, without detriment to the other, whereas in mutualism both partners benefit. In parasitism, where one species lives off another host species, the host may not be adversely affected or may even be killed. In amensalism one species is inhibited by another species which is unaffected as in antibiosis where the unaffected species produces a metabolic toxic to other species. Limiting interactions may also occur such as in predation of one species by another and in interspecific competition between species for the same resources.

3) Energetic of an Ecosystem

The energy in an ecosystem flows from autotrophs and is passed on to heterotrophic organisms through the food chain. With each transformation, from one trophic or nutrition level to the next, energy is lost. An ecosystem usually consists of three to six trophic or food-chain levels of organisms through which food is passed. A shorter food chain will result in a greater amount of biomass being produced from a given amount of energy. In all ecosystems however, many food chains link to form a highly complex web involving different autotrophs and heterotrophs.

4) Biogeochemical Cycling

The chemical components used by organisms tends to be circulated through the biosphere by physical and chemical processes. Nutrients and elements are also cycled through an ecosystem. Within the ecosphere the rate of cycling of chemicals is often regulated by biological system. The global biogeochemical cycles are affected by transport via water and wind, geologic movement and, in a certain cases, by movement of organisms. Slow chemical transformation occur in the sedimentary cycle and faster transformations occur in biological units which act as reservoirs for materials.

5) Limiting Factors

The success of an organism in a habitat or ecosystem depends on its essential environmental factors being within certain limits. These limits may be a function of the state of the environment or of the population of organisms.

Shelford's and Liebig's Laws

The concept of limiting factors, or the law of the minimum, originated from Liebig's postulate that the required environmental factor which most closely reaches a critical minimum will tend to limit the further growth of a species population. Shelford postulated that maximum limits of tolerance also existed. These concepts are embodied in the principle of tolerance which states that an organism can survive only when both its maximum and minimum limits for all essential environmental factors are not exceeded.

6) Succession

The structure and state of an ecosystem undergoes change from a less complex to a more complex and mature one. Each community in this series of successional changes is known as a serial stage. The final stabilized stage is called the climax. The succession involves changes in the ecosystem communities and in the physical environment and takes place over decades. The climax community will continue to exist in a state of equilibrium (as long as environmental conditions remain favourable).

7) Disruption and Exploitation

Natural or man-made events may reduce the diversity and stability of an ecosystem. Man exploits the ecosystem by directing productivity for his needs. Most life-forms have common biochemical needs and conditions in order to function at an optimum level. Thus, in extreme environments, few life forms can exist and the species diversity would be low. Another major factor affecting diversity is environmental quality. Pollution may reduce diversity by creating abnormal conditions which may exceed tolerance limits of a number of organisms.

Ecosystem Organization and Function

An ecosystem is made up of the integration of the different communities of species within an abiotic environment. The ecosystem has two major energy or trophic components: autotrophs, which are self-nourishing, usually have the ability to fix light energy and use inorganic substances to build complex organic substances; and heterotrophs which have to utilize, rearrange and decompose complex material from other complex sources. The ecosystem is the basic functional unit in ecology as it includes both biotic and abiotic components, and the results of their interaction, (for example) in terms of the energy flow, food chains, diversity, nutrient cycles and succession.

The Concept of Ecosystem as an Ecological Unit

An ecosystem, in an area therefore is any unit that includes organisms interacting with the physical environment so that the energy flow results in a trophic structure, biotic diversity and material cycling in the system. The first trophic level is represented by autotrophs or producers. The second level consists of herbivores or primary consumers. The tertiary consumers are carnivores. These components are also called functional groups.

Autotrophs

Autotrophs are organisms which can create their own food and use light as an energy source. Chemotrophs oxidise inorganic substances in order to obtain energy. On land, in established ecosystems, phototrophs are much more important than chemotrophs. In the water, phytoplankton have a dominant role. Most aquatic life is found in the surface few metres of the water column, being inhibited by lack of light deeper down. Primary production is dependent on light intensity, temperature, nutrients, water and the movement of materials through the ecosystem. The more productive areas of the world are, in decreasing order, certain shallow water areas, most forests, alluvial plains with natural communities or under intensive agriculture of a productive crop; grasslands, coastal seas, shallow lakes and ordinary agricultural land; and certain oceans, very deep lakes and deserts.

Heterotrophs

Heterotrophs exist on higher energy level and need to feed on other organisms, either plant or animal. Depending on their method of obtaining food heterotrophs can be classified into saprophytes, parasites and holozoics.

Components of an Ecosystem

In addition to the biotic producer, consumer and decomposer organisms, inorganic and organic substances and climatic regime may also be included as components of an ecosystem. The consumer organisms may be divided into macroconsumers or phagotrophs, which are mainly animals, and microconsumers such as bacteria and fungi.

The Abiotic Factor

The abiotic components include light, water, gases, minerals and nutrients. These substances may sometimes be in a form which cannot be readily utilized by living organisms. The availability of these substances in a suitable form determines the productivity of an ecosystem. This availability is dependent on the release of the required substances from a solid into a

soluble form which can be utilized by organisms.

Producer Organism

Producer organisms such as bacteria and plants can manufacture their own nourishment from abiotic substances through photo or chemosynthesis. All life depends on this ability.

Consumer Organisms

These heterotrophs can only obtain their nourishment from producer organisms either directly or indirectly. Primary consumers or herbivores feed directly from plants. Higher order consumers rely wholly or partially on lower-order consumers.

Decomposer Organisms

Decomposer Organisms are saprophytic, that is they feed on decaying organic material by degrading it. They are the final link in the cycle of life and return organic components into a form which can be utilised by plants.

Energy Flow in an Ecosystem

The behaviour or flow of energy through an ecosystem is governed by the two laws of thermodynamics which states that energy is neither created nor destroyed, only transformed and that energy is dispersed at each transformation. In an ecosystem energy flows from one trophic level to another. Autotrophs are at the first trophic level. Heterotrophs exist at higher trophic levels. An ecosystem usually has three to six trophic levels. As energy is dissipated at each transformation within the trophic structure, a greater the biomass can be produced from a given amount of energy if the food chain is shorter.

Material Flow in an Ecosystem

All abiotic components in an ecosystem are undergoing a state of change and exist at some phase in a cycle. Some 40 elements are required for the synthesis of living material or protoplasm. It is important to note that different organisms tolerate different concentrations of elements. The cycling of elements involve physical and chemical processes. A brief outline of several cycles are given.

Hydrologic Cycle

The hydrologic cycle , figure 1, includes the aqueous phases of the cycles of other substances and is essentially the passage of water from water bodies to the atmosphere and to the lithosphere.

The Carbon Cycle

Carbon is the basic building block for organic molecules and enters the ecosystem through the process of photosynthesis. Figure 2, illustrates the carbon cycle.

Nitrogen Cycle

Nitrogen is the most common element in the atmosphere. Terrestrial bacteria represent an important source of fixed nitrogen. From figure 3, it can be seen that the cyclic flow of nitrogen is dependent on bacterial action. Nitrogen is an essential component of amino-acids and proteins.

Phosphorus Cycle

Phosphorus is an essential element in all living organisms and is utilised in protein synthesis but is not very abundant. Phosphorus may be lost to the cycle by entering marine deposits or becoming insoluble rocks. Figure 4, illustrates the phosphorus cycle.

Sulphur Cycle

Sulphur is also an essential element in protein synthesis. It is less likely to limit ecosystem productivity than phosphorus. Figure 5 illustrates the sulphur cycle.

Other elements also play vital roles in the ecosystem and similar flowcharts may also be constructed.

Ecosystem Stability

Ecosystem stability or homeostasis implies a balance not only of species but also in nutrient cycles and ecosystem function. A stable system will tend to restore its stability if disturbances occur. An artificial ecosystem have however intrinsic instabilities which need to be controlled.

Population Regulation

The population of a species in a stable composition will fluctuate about a mean value which may be regulated by density of the species or be environmentally induced. Density-dependent regulation implies some homeostatic mechanism working to control birth and death rates. When resources are limited for a population size, population growth slows down to a level which the habitat can support or emigration may occur. Emigration, predation and chemical inhibition may also control population. Density-independent processes such as climate can also affect population size. Density dependent and independent processes may act together or separately to regulate population.

Succession and Ecosystem Change

The tendency for an ecosystem to develop, in an orderly, reasonably predictable manner, into a steady, mature climax state, resulting from modification of its physical environment by the communities concerned, is called succession. Most ecosystems climax in the scale of 1000 years or more, although some climax within a human life span. Few climax systems exist today often due to man's intervention. Succession can be divided into two stages: primary and secondary.

Primary Succession

Primary succession starts with the establishment of a community in a previously sterile area. Weathering processes alter the area sufficiently for simple plants to establish themselves. The plants alter their habitat and more organisms invade to form the pioneer community. The ecosystem evolves further with the formation of a secondary communities. Eventually a climax ecosystem develops and the change in the physical environment will reach a maximum under the climax ecosystem.

Secondary Succession

Secondary succession differs from primary succession only in its starting point. Secondary succession starts after an ecosystem has been drastically altered by natural or man-made catastrophes.

Ecosystem Exploitation and its Consequences

Man's increasing demand for materials and energy has increased wealth but has also placed pressure on the environment through willful and intense exploitation of natural resources. This has often resulted in the destruction of ecosystems.

Deforestation

Forest ecosystems present a vast reservoir of diverse organisms and exert considerable influence on the physical environment, biogeochemical cycles and on climate patterns. Removal of forests result in disruption and erosion of the quality of the habitat.

Consequences of Deforestation

Deforestation results in soil erosion , increased siltation in water ways, reduced soil fertility and a degraded watershed area. The amount of forest products obtained is also reduced. In many South-East Asian countries approximately 80% of the deforestation is due to conversion to agricultural areas at a rate in the order of 104 to 105 hectares per annum. The practice

of shifting cultivation also contributes to devastation of forest areas at a rate similar to that above. Over much of Southern Asia and the South Pacific approximately 2% of the operable forest area is lost through realienation for other purposes, such as agriculture.

Mineral Exploitation and Consequences

In South-East Asia mineral mining has resulted in deforestation, with its ensuing problems, and also in toxification of land and drainage systems. Salinization also occurs as result of deforestation and is the accumulation of salts in soil so as to inhibit fertility. Climate and agricultural management practices can also contribute to salinization. Water-logging in saline soil can also enhance the problem as was the problem in Pakistan. In Nepal the repercussions of deforestation, and the resulting soil erosion, were enormous. The balance of the hydrological cycle was altered with increased surface runoff and frequent floods. Siltation reduced the area of two lakes by half. Climatic changes were experienced due to lost of forests. The effect of soil erosion in Nepal has also been felt by its neighbour, India, which receives 240 million cubic metres of soil annually by river.

Desertification

Approximately 630 million people currently live in arid or semi-arid lands. It is estimated that approximately 6% of extremely arid, arid and semi-arid lands are due to anthropogenic activities. The problem of desertification is global as two-thirds of the world's nations are threatened by it. The annual rate of desertification is estimated at six million hectares a year with possibly close to one million being in Asia and the Pacific region. Human pressure on the environment has been the main reason for this process along with climatic vagaries. Bad agricultural and pastoral farming practices have also contributed to the process in Australia and on the Luni Block. In Bangladesh the process of desertification is due to changes in the hydrological balance between groundwater recharge and the encroachment of saline water.

Implication (of the above content) for the Activities and Decision of the Target Group

Human Threats from Environmental Problems

Direct Biological Threats

Three or four major biospheric threats to humans may be identified: toxic substances, disruption of food systems exploited or which will be exploited for human and climatic changes that destroy habitats for man.

Conservation

The aim of ecological conservation is to insure the preservation of an environment of good quality and to ensure a productive and balanced ecosystem.

Environmental Debate

The environmental debate today revolves around two extremes: the belief that only drastic measures can pull the human society back from the brink of environmental disaster and the belief that the ecosphere is resilient and that there is still time to remedy errors of development. Public awareness of the environment and the threat of an environmental crisis is fairly recent; only since the mid-sixties. Technological advances has also enhanced global communication on the subject. Prior to this only few people voiced their opinion of the relationship between man and environment. In the eighteenth century, Malthus wrote of the need to balance population growth, with its logarithmic rate, against the capacity for food production, which only grew arithmetically. Scientific progress has only delayed this confrontation, while development techniques, which disturb the ecosystem, hasten it. In the late nineteenth century, Perkins work on man and his environment influenced the conservation movement in America. Soon after the Second World War, more wrote on the need to reconsider the process of growth and development. They were usually regarded as alarmists. By the mid-1960's it was recognised that the major causes of environmental degradation were the development technologies over the past 70 years which did not take into account the effect on ecosystems. The result was damage so great that our present priorities must be to repair the damage and to implement more ecologically-sound techniques.

Population Dynamics

Population Dynamics is the study of the changes in the size of a population. A population occupying a particular area has certain statistical characteristics which are a function of the group, such as its potential reproductive capacity for population growth.

Patterns of Population Growth

The population of an organism will continue to grow until it reaches a constant, maximum specific-growth rate which is determined by environmental conditions. When conditions are favourable, population may grow logarithmically. Among the factors which limit population growth are the interactions between species and among organisms of the same species, through, for example, competition. Growth rates may also be affected by density-dependent and density-independent factors such as food shortages and climate respectively. An important indication of

the pattern of growth of a population is its age structure: faster growing communities have more young than slower growing ones. The age structure, in turn, indicates trends in behaviour of the community.

Malthusian Growth

Malthus felt that the growth in population would be exponential and would quickly outstrip food supplies which would only increase arithmetically.

Logistic Growth

Verhulst, however, proposed that population growth could be explained by a sigmoidal or S-shaped curve that would reach an upper limit in an orderly manner after a period of exponential growth.

World Population Growth

Very little is known of the past rate of population growth. Estimates of world population over the last 200 years show unparallel growth in recent decades which show no sign of diminishing. More than 2000 years ago the rate of growth could be estimated at one quarter of a billion persons per 50,000 to 100,000 years. In recent years, since the discovery of America, the rate of growth is estimated at a quarter of a billion persons per 6 to 7 years. A small group has attempted to arouse public awareness of the population explosion problem. This group also believes that it is possible to improve the general standard of living indefinitely, although with a consequent decrease in the rate of population growth. Estimates of the maximum population, which can be supported, range from 2-8 billion, a number already surpassed, to 50 billion, a number which will probably be reached in 150 years at present growth rates.

International Concern for the Humanity and Environmental Relationship.

Most nations show some concern for environmental problems. Public interest has been stirred by ecologists, planners and legislators and by the publicity given to environmental disasters.

Global Environmental Concerns

In the late 1960's it was realised that there was a need for international or global cooperation in order to deal with environmental problems with transcended boundaries. In 1972 the United Nations Conference on 'The Human Environment' involved more than 100 nations and formulated several resolutions. The resolutions were mainly directed towards international cooperation and assistance on the environment, the control of

waste discharges and the pollution of the seas, the management of living and non-living resources and the problems of development. In the same year the Club of Rome, a group of consultants, scientists and computer experts produced a report, entitled 'Limits to Growth', on the predicament of mankind. The report was based on a computer model of the trends of population, pollution, natural resources, agricultural and industrial capital output for a period of 200 years starting from 1900. The general conclusion reached by the Club of Rome was that the growth of the five parameters modelled could not continue to grow indefinitely as the world was finite. The Club sought for an equilibrium pattern of behaviour, and a smooth transition towards it, that would result when the growth limits of the parameters were reached.

Third World countries criticised the possible motives of the Club of Rome and saw the report as maintaining the status quo. It was generally recognised however that material growth could not continue forever and that the choice lay between choosing when to limit growth and letting growth continue up to its limit. According to the model, letting growth continue indefinitely would be worse than deciding a limit. Economist and politicians have criticised the desirability of a steady-state economy. The Science Policy Research Unit at Sussex University published 'Thinking About the Future' a critique to the Club of Rome report, based on their own model results. This indicated that small changes in parameterization of the trends of growth would produce quite different results.

The United Nations Environment Programme

The United Nations Environment Programme (UNEP) was established on the recommendations of the Stockholm Conference. Its headquarter is in Nairobi with regional and liaison offices in different regions of the world. It administers the Environment Fund and coordinates activities of the programme and of other cooperating organisations of the United Nations. Six subject areas were defined by the Stockholm Conference : human settlements and human health; terrestrial ecosystems; environment and development; oceans; energy; and natural disasters. General functional problems of environmental assessment, environmental management and supporting measures were also identified. The Stockholm Conference framework of interest areas and functional problems were slightly modified by UNEP. UNEP itself does not implement any programmes, it only reviews, recommends programmes and offers financial assistance. It does this on three levels : providing information on the state of specific environment problems; recommending objectives and strategies for an environment programme to interested groups; providing financial assistance from the Environment Fund to identified projects.

B. DISCUSSION

1. Basically the organisation of the Chapter is well defined. The substance discussed has covered to a certain extent, the concept of the environment and its relationships to other components such as the physical, ecological, biogeochemical and man environment. The sociological, economical, cultural, and political aspects of the environment are not specifically mentioned in detail. This does mean that either these factors are deliberately excluded from the texts or the true concept of the environment is unclear and misspelled. Those who are knowledgeable in the environmental field may feel that there are insufficient information or facts to support the ideas presented. Actually, there is an allowance made to create the feeling that the environment basically consists of the physical, biogeochemical and man-made environment. Their interactions and interrelatedness play a major role in the existence of life on the surface of the earth.

2. Sections on the ecological concepts and the ecosystems are well covered. But there is still a general feeling that the facts presented are too technical and should be simplified and more diagrams could be added. The outline of the sections should be rationalised so that less overlapping of materials would occur. The topics on population dynamics, environmental exploitation and its implications contain general ideas but could be expanded.

3. General comments from the workshop are as follows:

a) The sourcebook is not for the man on the street but for people like agricultural extension workers, educators, trainees, farmer cooperative, etc. Chapter 3 is meant to have a wide scope. The environment should be treated in totality. Environment should cover both (i) man-made and (ii) natural. The natural environment would include the physical and ecological aspects.

b) The Chapter is mainly on ecology. There is little relation to how man react to built environment and to change environment. There is a suggestion that the content of the Chapter be changed. Basic concept should be included not just biological concepts. Concepts like sociology, economics and politics should be included so that people from various background can understand. Section 3.2.2 in particular minimises the scope of the environment because it is restricted to ecology.

Perhaps a model diagram showing the different aspects of the environment should be introduced. Then each aspect should be discussed in the Chapter and the interlinkages can be highlighted and elaborated upon in later chapters. Emphasis should be placed on the immediate environment of the human being and not on other

aspects like stratosphere which a layman cannot relate to. The Chapter is written in a style which is too technical and difficult to be transformed into an easily understood form.

c) Chapter 3 should be viewed by examining the purpose. If the purpose is limited, it appears adequate. If the purpose is to look at the environment in totality, then it is inadequate.

d) It is important to introduce case-studies. These case studies can relate the environment to basic concepts as well as to socio-economic factors which have caused problems. This would be one way of illustrating the inter-relationships between physical and socio-economic realities. For example, in Nepal, deforestation changed the climate and the hydrological cycle. It also affected India. Thus making the problem global.

e) Coverage inadequate because it did not include other aspects of the environment. It is too ecological in approach. The Chapter is also too long. The title "Environment" should remain.

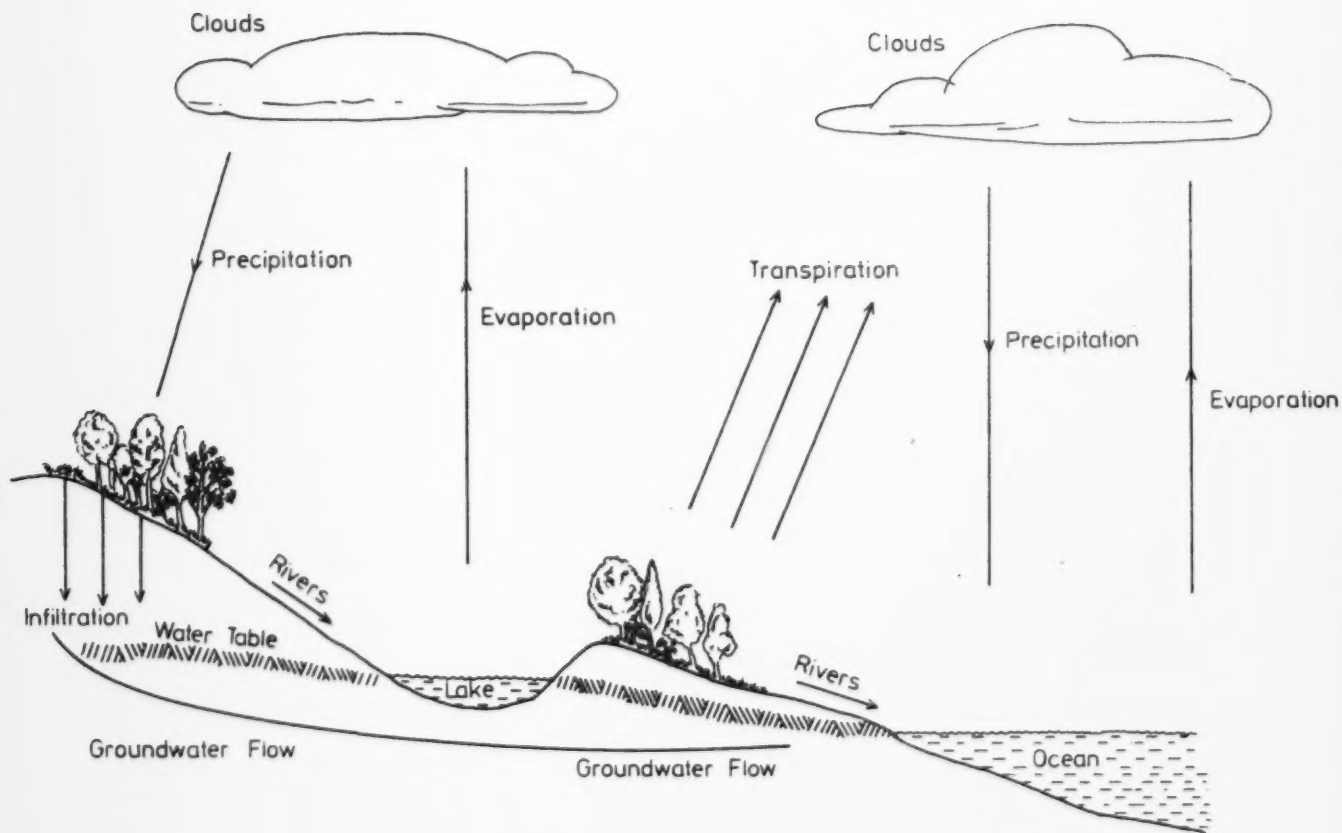


Figure 1 : Hydrologic Cycle

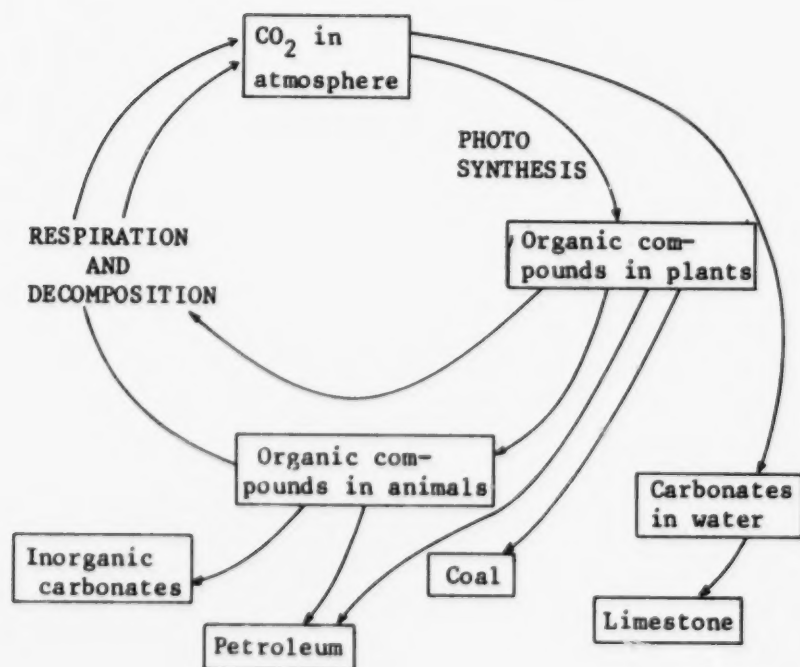


Figure 2 : Carbon Cycle

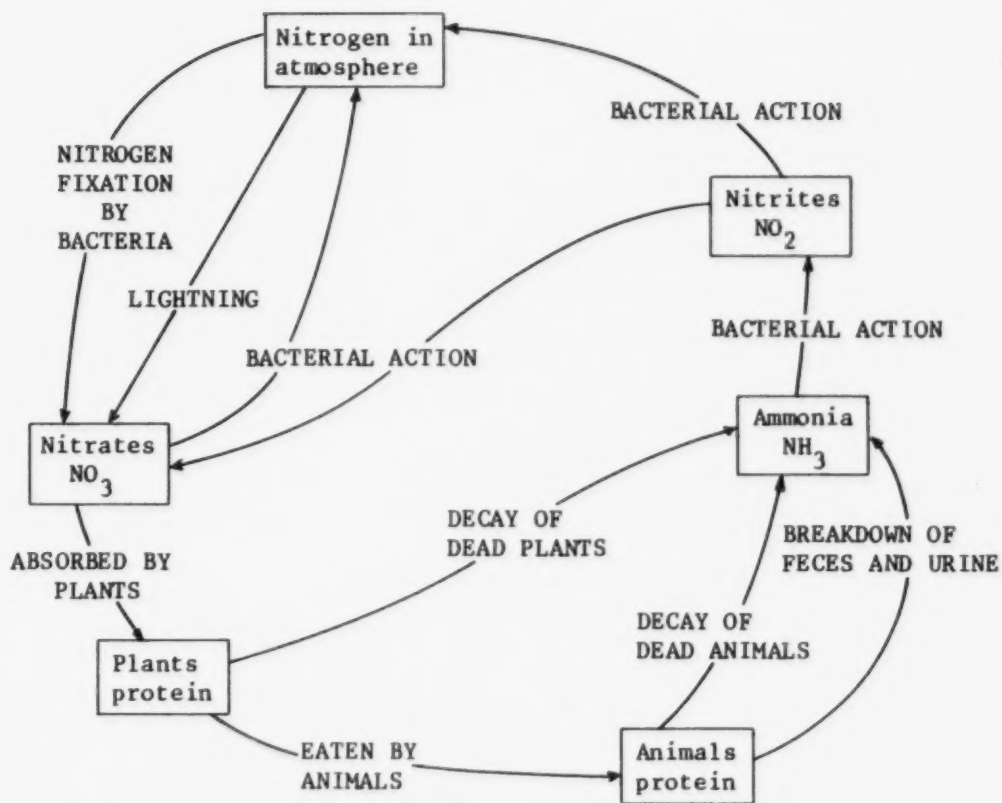


Figure 3 : Nitrogen Cycle

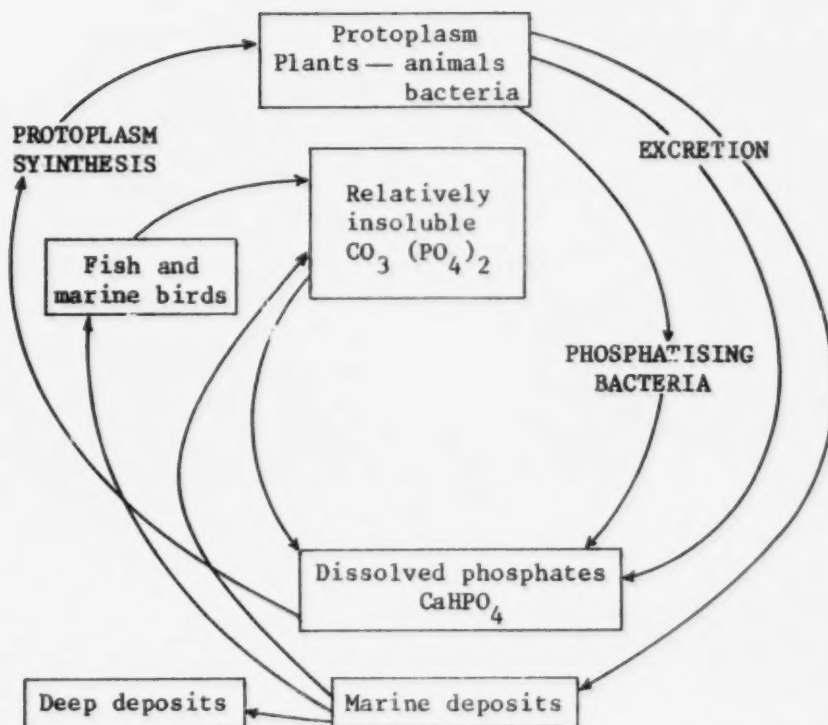


Figure 4 : Phosphorus Cycle

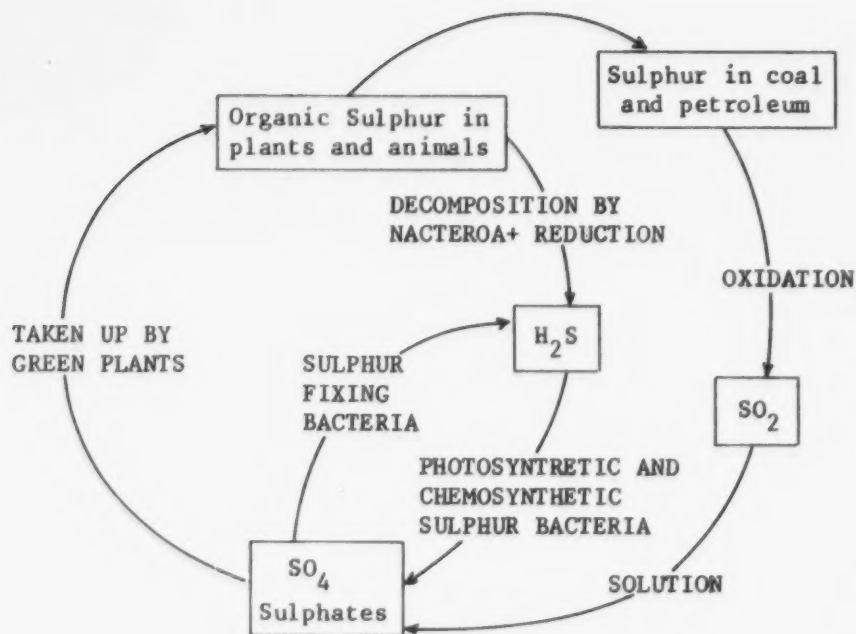


Figure 5 : Sulphur Cycle

VII. CHAPTER 4 : ENVIRONMENTAL PROBLEMS

The following resume of Chapter 4 was presented at the workshop by Ir. Gurmit Singh. Following the resume a summary of workshop discussion with comments on the same chapter is recorded.

A. RESUME

Nature and Scope of Environmental Problems

The Human Environment

There is a dynamic interaction between man and his environment which embraces all parameters that affect his life. Quality of human life improves if man acts in harmony with nature. This entails a sustainable management of all forms of natural resources, ranging from water to energy.

Environmental problems often arise from poor planning and management of resources. Widespread poverty compels communities to undermine the natural resource base. It was the realisation of these interlinkages that influenced the discussions at the UN Conference on the Human Environment held in Stockholm in 1972. Not only did this conference increase public awareness but drew up plans of action. Regretably the impact on the international community has been inadequate. Many countries still continue to give low priority to environmental quality.

Global Environmental Problems

Not only do perceptions but the nature of environmental problems differ between developed and developing countries. While the former are more likely to be those arising from urbanization and high technology, the latter are faced with poverty and the provision of basic needs. Nevertheless environmental problems often transcend national and regional boundaries. International co-operation is thus imperative.

Population Growth

At the present annual rate of growth of 1.9%, the world population may exceed 6 billionn by the year 2000. By this time the developing countries share will increase to 80%. This combined with the rural-urban drift is likely to offset economic

development while placing stresses on the natural resource base. It will also make reduction in income differentials extremely difficult.

Nutrition, Land and Soil

There is already a problem of chronic undernutrition in developing countries. Land degradation and soil loss is on the rise. Population increases will only aggravate these problems.

Energy

Energy is vital for both life and economic growth. The oil and wood crises dramatise the fragile nature of our current energy sources. The air, water and land environmental stresses of conventional energy sources have prompted an interest in renewable non-conventional energy sources, such as solar and tidal energy but it is strongly dependent on technological improvement to make it more efficient and economical.

Air Pollution

Air pollution is created both by natural and man-made sources. Although the pollutants may be diluted by dispersion, they may persist for long periods and be circulated globally through atmospheric movements.

The major air pollutants are:

- a) Sulphur and nitrogen oxides: These are generated from the combustion of liquid and solid fuels, giving rise to acid rain: They cause damage to plant and animal, including human life;
- b) Carbon monoxide and carbon dioxide: Carbon monoxide is mainly generated by petrol driven motor vehicles and is abundant in traffic jams. It has adverse effects on the nervous system. CO₂ levels around the world are increasing as a result of deforestation and large scale fuel combustion and weather stability is in jeopardy;
- c) Hydrocarbons: Both fuels and solvents generate this pollutant which leads to the formation of photochemical smog. There is scientific concern that some of the reactions will result in the depletion of the ozone layer in the stratosphere;
- d) Suspended particulates: These are particles of 10 μ m diameter or less produced from a variety of sources including forest fires. They cause respiratory disorders and can also react synergistically with sulphur dioxide and nitrates.

Water Pollution

Water is one of the basic human needs yet only 1% of the world's surface water is usable from a practical point of view. The natural selfpurification capacity of the water cycle has been upset by the excessive amount of man-made pollutants entering the cycle.

The major pollutants are:

- a) infectious agents like pathogenic micro-organisms that cause diseases ranging from typhoid to schistosomiasis;
- b) oxygen demanding wastes that include sewage, agrowastes, and animal feed-lot run-offs;
- c) organic and inorganic chemicals including those from pesticides and fertilizers;
- d) sediments as a result of mining and land development;
- e) thermal discharges especially from factories and power plants;
- f) radioactive materials which are generated by mining, processing and nuclear weapons testing;
- g) heavy metals including lead, zinc and mercury.

Generally pollution from non-point sources is on the increase.

Solid Wastes

These increase with urbanisation and industrialisation and include all non-liquid and non-gaseous waste materials arising from domestic, trade, industrial, agricultural, mining, and services industries. Although the most obvious damage is aesthetic, solid waste also increases health hazards, water pollution and sometimes air pollution. Hazardous components are on the rise.

Pesticides and Related Compounds

The indiscriminate application of pesticides, especially in the developing countries, is a growing problem. Their prevalence and persistence in the environment, together with their toxicity, are a threat to humans, as well as all other forms of life. The other threat is their non-specific action, i.e. they affect non-target organisms as well.

Ionizing Radiation

The major source of this hazard is nuclear power generation and weapons testing while the ultraviolet rays within sunlight pose a lesser threat. There is also a small amount of natural background radiation. The greatest environmental threat is posed by long-life radionuclides, either through the air, water or food.

Noise Pollution

Prolonged exposure to high noise levels produces psychological and physiological effects on humans, resulting in permanent deafness ultimately. Noise sources include traffic, aircraft, industries, commercial premises, and human communities. Traffic noise is on the increase and a dominant source. Unfortunately, this pollutant is not adequately tackled in developing countries.

Trace Metals and Chemical Mutagens

These include cadmium, lead, nickel and manganese. They are toxic and bio-accumulative and do enter the human food-chain. Although organic micropollutants like trihalomethanes may be present at relatively low levels in drinking water, they pose a definite health hazard.

The Work Environment

Exposure to chemical and physical pollutants occurs in almost all work environments, with the situation more severe in developing countries, where many workers seem to be unaware of the risks. Many occupational diseases like asbestosis arise from the polluted workplace but satisfactory occupational health standards are still rare in the developing world.

The causes of environmental problems in industrialized and developing countries

Prior to the Stockholm Conference environmental management was fragmented among nations as well as types. Despite avowed commitments to integrated management, the last decade has failed to live up to expectations.

Attitudes and Priorities

Attitude is perhaps the most important single factor in environmental pollution control. The low priority given to environmental issues in developing countries vis-a-vis economic growth is partly due to lack of public environmental awareness. Only recently have developing country governments started to implement environmental control measures.

On the other hand, the richer populations of the industrialized countries places greater emphasis on environmental quality. There are more effective control measures and their problems are more often associated with new products.

Environmental Awareness

Environmental awareness by the general public is essential for sound environmental management. Information dissemination by the media is vital to increase such awareness. Non-governmental Organisations (NGOs) also play an effective role especially in the Asia Pacific region. A formal input is through environmental education, right from schools to universities.

As mentioned earlier, the industrialized world's citizens are more aware and the prime movers for environmental protection. Yet there are pockets of the relatively poor who are too pre-occupied with economic survival.

Overall there is still much room for increasing awareness.

Economics and Pollution Control

Many enterprises, especially in developing countries, regard pollution control as non-productive and natural resources 'free'. Hence to them environmental protection is a market externality. Consequently an opposing group sees industrial development undermining environmental quality.

Eco-development is the solution to the apparent conflict in perceptions. Unfortunately even in developed countries, there is little political recognition of the linkages between resource depletion and economic recession.

Training and Manpower Resource

In most developing countries, industrialization commitments almost always precede environmental policies. This invariably

means an inadequacy of skilled environmental personnel, who include:

- a) environmental control staff,
- b) environmental planners and managers,
- c) environmental engineers or technologists.

Industrialized countries can help in such manpower training. At the same time it is necessary to share treatment technologies.

Environmental Policy and Discontinuities

Evolving adequate environmental policies in developing countries is handicapped by the scarcity of appropriate environmental expertise as well as predominance of economic priorities. Another problem is associated with geographical jurisdictions and categorical divisions.

Although environmental problems tend to be inter-related, laws and enforcement agencies are often compartmentalized. Many developing countries also do not provide for public participation in decision-making. Environmental impact assessment requirements are also a rarity.

Pesticides and New Products

Although there is increasing awareness among all sections on the environmental threats posed by pesticides and chemical compounds, the trend towards less persistent but more toxic products is not without risk. In fact, more effective monitoring, assessments and regulations are vital.

Special Problems

The existing control measures are not able to abate some environmental problems. Alternative solutions have to be worked out.

The Impact of Environmental Problems on Ecosystem with Man as its Integral Part

Although all living things modify their ecosystem to some extent, man has placed unprecedented stresses on his environment. It is relevant to measure environmental problems in their impact on human health and well-being.

Environment and Ecosystem

Every component of the ecosystem is important and its survival depends on the balanced dynamic links between its biotic and abiotic components. Organisms can only survive by adjusting to changes in the environment.

Impact of Pollutants

The scale of human activities has caused serious disruptions to the hydrologic, biogeochemical and sedimentary cycles. Pollutants have either decreased ecosystem productivity or threatened species survival.

The 'Green Revolution'

The 'green revolution' has produced several negative environmental impacts including pesticide pollution and reduction in mineral recycling. Slash-and-burn agriculture also take its toll on tropical forest ecosystems.

Effect of Air Pollution on Ecosystems

The human costs of air pollution range from a variety of respiratory ailments to kidney poisoning. Vegetation is dwarfed or destroyed, metals bioaccumulate in plants and aquatic organisms, and structures corrode. Acid rain poisons the soil and lakes, while forests are gradually 'killed'. Ozone depletion increases the risk of skin cancer.

Effect of Water Pollution on Ecosystems

Water pollution has a direct impact in the form of infections, acute and chronic toxicity, and mutagen and carcinogen-induced effects. Spray irrigation of sewage effluents produces aerosol dissemination of enteric micro-organisms which can infect humans within a 1 km radius. Sewage contaminated water is the principal cause of diseases like cholera, typhoid and dysentery. Trace metals present in water can result in damage to the central nervous system or cancer. Eutrophication of water system is another effect.

Impacts of the Structural Environment

Environmental impacts of projects are influenced both by project type as well as their specific environmental characteristics. Societal impacts from employment pattern changes must also be considered. Biological ecological changes produce direct health impacts. Unfortunately most countries adopt curative solutions rather than preventive measures with improved primary health care facilities.

Causes, Effects and Control of Environmental Problems

The Seveso, Three Mile Island and Bay of Campache incidents illustrate the consequences, problems of uncertainty and risks associated with projects with potential impacts on environment. The main causes of global environmental problems are:

- a) population increases;
- b) increasing demands for food;
- c) congested living areas and inadequate shelter;
- d) excessive energy consumption and wastage;
- e) population movements.

There is a realisation that environment and development are compatible and both the developed and developing countries are beginning to adopt environmentally positive policies.

Diseases and Water Projects

Four historical water-borne epidemics are mentioned. The World Bank lists health related impacts of watershed development and irrigation projects on inhabitants of the project area. These range from tuberculosis to malaria and increase health care costs. Effective sanitation and safe water supplies are essential.

Environmentally-related Diseases

Chemicals in the Environment and their Health Effects

A thousand new chemicals enter the market annually and there is a major concern with the effects of low-level long-term exposure to many chemicals in the working environment. Some

chemicals are carcinogenic while high irradiation produces almost the same results. There is an urgent need to control all hazardous chemicals and test via bioassay all suspect chemicals.

Air Pollutant -related Diseases

An additional risk of air pollutants is morbidity increases. Many of the resultant diseases are chronic and occur after long / substantial exposure.

Toxic Metals

A wide range of lung and nervous system disorders are produced by such metals. Like for other pollutants, both epidemiological studies and environmental monitoring are necessary.

Activities of Target Groups and Environmental Actions and Legislations

There is increasing recognition, even in developing countries, that proper environmental resource management is vital and that this should be the concern of all. There is a need to broaden environmental concern among all citizens through both formal and non-formal means. Environmental education must instill a sense of responsibility for the environment, while at the same time arming students with the necessary skills.

NGOs require access to information as well as the media for them to play an effective role, which includes a watchdog element. Governments, especially those in developing countries, have a significant role in enacting and enforcing legislation as well as ensuring adequately comprehensive planning and control.

Environmental legislation needs to be simple, flexible and practically enforceable. It may have to be country-specific and allow for some differences in standards.

Environmental Impact Assessment (EIA)

This is essential for effective environmental management and pollution control since it integrates environmental values at planning and implementation stages. It also allows for the evaluations of alternatives and public participation.

Monitoring and Surveillance Activities

An efficient monitoring and surveillance network is essential for environmental work. It enables early warning and prevention.

Environmental Information

Reliable, relevant and up-to-date information is needed not only by decision-makers but by all environmental actors. INFOTERRA and International Register for Potentially Toxic Chemicals (IRPTC) are two examples of the global attempts to exchange such information.

B: DISCUSSION

The topics dealing with 'elimination of species' and 'genetic diversity in relation to new crops' is poorly dealt with. There is no in depth discussion on 'Desertification' and 'Deforestation' which are important topics and should be included. In general, the term 'environmental actors' would be more appropriately used rather than 'target groups'. These actors include (i) the government, (ii) industry / business, (iii) academia, (iv) Non-governmental Organisations, (v) citizens.

The general consensus is that there should be a section on poverty and its effects on environment. The chapter is also weak in discussions on public participation. But perhaps this could be in the section on Development (Chapter 7). In section 4.2.10 in the sourcebook, the title or terminology "The Work Environment" should be changed to "Occupational Hazards" which is really the issue.

The armaments race is an important issue in relation to causing environmental problems, but this is not mentioned in this chapter. With regards to the length of the chapter it is lengthy but this chapter is the heart of the whole book i.e. we are concerned because of the existence of environmental problems. Perhaps the section dealing with population can be reduced and more diagrams, charts, and photographs added into this chapter.

Value judgements should not be included. In page 262 in the sourcebook, last paragraph, it implies that poor people are less concerned about environmental problems but this may not be completely true in many countries.

VIII . CHAPTER 5 : NATURAL RESOURCES

The following resume of chapter 5 was presented at the workshop by Dr. Abu Bakar Jaafar of the Department of Environment, Malaysia .

A: RESUME

This chapter describes what resource is and defines raw material and the result of Man's activities on these materials. The present ecosystem of the world is partly the result of the distribution of these raw materials. It then gives recommendations concerning the distribution of wealth and better education. There are 9 sections namely ;

1. The concept of natural resources
2. Limitation and finiteness of Earth resources
3. Non-uniform distribution of resources
4. Renewable resources
5. Non-renewable resources
6. The use management, conservation and recycling of resources
7. Implication for the activity and decision of the target group
8. Proposed action and legislative measures on this subject
9. Anthropoecological concept of versatile and healthy development

The Concept of Natural Resources

To define resource , these elements or dimensions are introduced - namely , matter which is substance or energy, human society and location or place. Therefore , resource is a function of input of substances through a society, within a particular place or a certain location . Unwanted or negative resource is regarded as waste .

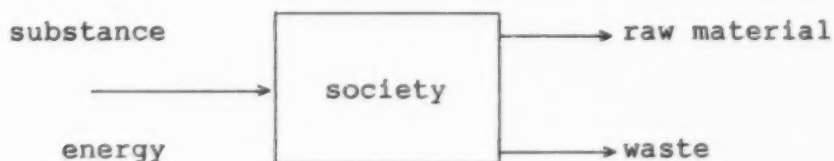


Figure 1. Conceptual idea of natural resource

In order for a substance to be considered a raw material, two conditions must be fulfilled.

Condition 1: The substance must go through some processes. It is only a raw material if the society needs it and is capable of using it. Thus it becomes part of the interaction between the human society and the environment. These include wood, stone, metals, rare elements and petroleum etc.

Condition 2: The substance can only be considered a resource if there is some degree of difficulty in obtaining it or if it can be considered rare. Applying this condition, substance which is available in unlimited sufficiency is thus not considered raw material. Therefore until recently pure air even though is used by the society is not considered as a raw material.

Limitation and Finiteness of Earth Resources

The Earth resources are not only finite but also limited. Their availability is a function of several factors. The value of a raw material is given not only by the magnitude of its total reserves but also it is important to consider only the usable reserves related to the assumed consumption. Their applicability to a given use is also considered. The geographical distribution/location of the reserve and the ease with which the resource (raw material) can be exploited also contribute to its value. The value is further enhanced by the intensity of demand and interest. Resources are said to be non-renewable when the rate of their regeneration is less than the rate of their exploitation. In this respect an issue is raised as to whether or not most non-renewable resources be exploited.

Non-uniform Distribution of Resources

The resources are not uniformly distributed on earth. Rich regions have large deposits of minerals while others have less or none existence. In the sourcebook a table list out how 18 important deposits of raw materials are distributed among the countries. Most of the large deposits are found in the USSR, USA, Australia and Republic of South Africa.

Renewable Resources

Renewability means that there exists a process by which the resource is continuously renewed at a rate of at least the same as the rate of exploitation. A typical example is the water resources on the Earth, where it is continuously replenish by water circulation. The Renewable sources are the wind energy and all forces and substances that depend on input of solar energy.

Renewable reserves must not only be exploited, it is necessary to take care of it and to ensure that it is being properly renewed. This apply for all types of renewable sources, living or non-living.

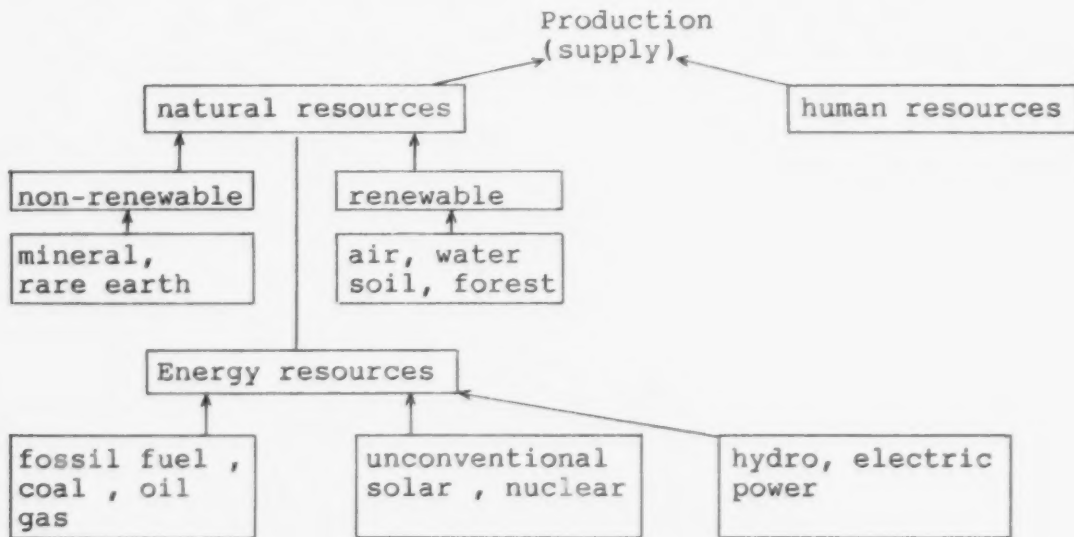
However an issue is raised concerning the soil being an exception to this generalisation. Over the years the quality of soil has been improved through the development of human civilisation/management. Fertilisers, pesticides and mechanisation have increased the crop (plant) yield. However, these have adverse effects such as soil erosion, the heavy machineries compress the soil and the excess chemical fertilisers disturb the flora and fauna balance of the soil. But the worst danger is the loss of agricultural lands to the cities and its amenities. So far, the expansion of agricultural soils has been increasing at the expanse of forests and other natural system especially in tropical region.

At present , industries depend heavily on raw materials from non-renewable resource which is tapped from the lithosphere. When this supply is exhausted the industries will have to turn to renewable raw materials which is provided by the biosphere. Hence, the biosphere will be a source of raw materials. Besides this raw material obtained from the biosphere are usually energetically advantageous though the treatment of raw materials obtained from the biosphere is usually more difficult technically than the production from raw materials of the geological character.

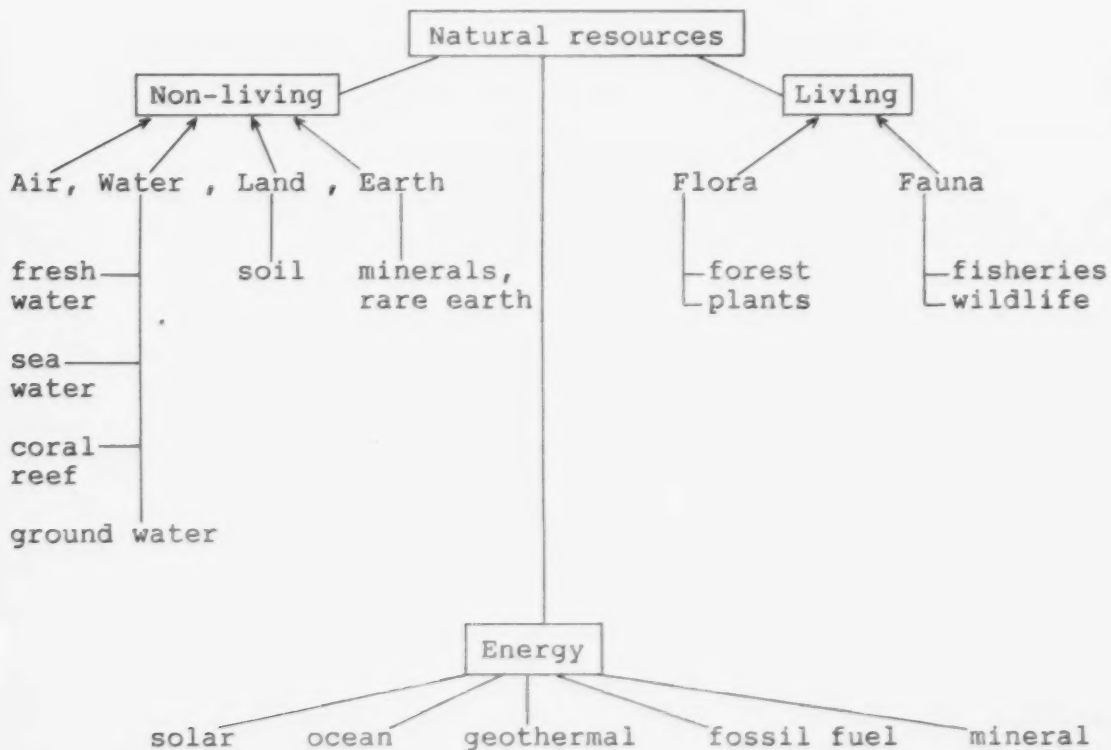
Non-renewable Resources

Non-renewable raw materials are primarily mineral materials that are obtained from deposits of rocks , ores , and fossil fuels . Mineral raw materials have been utilised by man since his appearance on the earth, firstly in the form of crude primitive rock tools. Then man utilised a wider scale of mineral raw materials such as metals and become more "sophisticated" with civilisation. The Industrial Revolution of the 16th century mark the beginning of the use of coal mining/technology - a new type of non-renewable resource as wood/timber became scarce. During the last centuries rare matals such as platinum, tungsten, vanadium, cadmium were on man's last of resources. The past few decades saw the emergence of uranium as a resource. However no raw material has had so profound effect on the modern civilisation as petroleum. Figure 2 shows a brief diagram of "Resource".

Figure 2 : Resource flowchart



It can also be describe as follows :



The Use, Management, Conservation and Recycling of Resources

It must be realised that all deposits can be depleted and that the resources of all mineral raw materials are limited. Therefore the raw materials must be rationally exploited and use only when there is no replacement. With careful use, management, conservation and recycling of resources the future trend in the use of resources is an optimistic picture. Firstly less material and energy will be needed and rare mineral such as metal ores and petroleum fuel will be replaced by less rare raw materials. Few rich deposits will be exploited and will be mined from greater depths even though this is more costly in terms of production but will not pose a problem of recultivation and spoilage of large areas as surface mining do. A new concept of mining is introduced whereby as many by-products of mining are used.

Implications for the Activity and Decision of the Target Group

Prior to resource utilisation or exploitation several criteria need to be taken into account. The first view is morality which partly contained in the legal code, laws and decrees. The Laws either exactly formulated or unwritten rules of social behaviour are more or less automatically observed. In this framed work appreciation of aesthetic aspect can also be loosely connected. The second is scientific. The Laws of Physics, mechanics, conservation are valid and cannot be circumvented or neglected. The third point of view can be called economic viability that is the advantages and usefulness of a certain project. The time factor is also important dimension that has to be standardised in any resource management. All these are to be considered simultaneously. The fourth aspect, ecology must always be considered since Man is inseparable from the environment. The man component of the ecological criteria is the requirement of careful management of the resources and also the human health and nature must not be harmed.

Proposed Actions and Legislative Measure

The UNO and its agencies are expected to play the main role in establishing a new international economic order whereby a more just distribution of profits and advantages from exploitation of natural resources as well as protect the resource from excessive exploitation. This is to ensure a balance ecosystem. The present state of resource utilization has given rise to two

worlds that can be summarised as follow:

Rich	Poor
literate	illiterate
industrial/urban	agrarian/rural
concern about the quality of life	disease/starvation
concern about the conservation of non-renewable resource	concern more of their exploitation and distribution for all mankind to benefit
impact of pollution	poverty

As it is both worlds have problems that are deeply rooted. It is hoped that the new international order be formulated to achieve a life of dignity and well being for all citizens.

Education is one of the main component of development as it not only contributes directly to individual satisfaction and know how but also prepare the individual mentally as well as morally for a future role in a changing world.

Eradication of poverty is the next concern. This is by reshaping the income distribution and thus satisfying the basic needs. There on the goals of development would be the elimination of malnutrition, disease, illiteracy squalor, unemployment and inequalities. Social indicators should be developed such that development progress can be measured.

The concept of "eco-development" is also introduced to help the people of a given ecoregion realise the full development potential of the resource endowment and environmental conditions of the region maximising the use of their own human resources and skills to produce the kind and quality of life to which they aspire without destroying the resource base on which sustained development depends.

Anthropoecological Concept of Versatile and Healthy Development

This section introduces a new concept, which is the idea of infinite exponential growth of economic development versus a return to natural economy and modest society. In searching for new pathways of a healthy development of a society, it is necessary to differentiate the natural resources that are utilised by the society from the point of view of their reproducibility and this has been discussed previously.

The environment is described as two subsystems, the biosphere (natural) and the technosphere (artificial), however there is no clearcut boundary. Based on the law of reproduction, two types of reproduction processes can be distinguished in the environmental system. As in natural subsystem, there is biological reproduction while economic reproduction occurs through the interaction between the subsystems of human population and form a basis for the formation of artificial subsystem. Biological reproduction occurs between living organisms and their environment on the basis of material and energy fluxes and their transformation for the purpose of continuous regeneration and future development of organisms and their relationships.

Economic reproduction is defined as a complex of continuously reproduced and (mostly) extending processes of the production, distribution, exchange and use satisfying the needs of human population.

The process of biological and economic reproduction occurs within the framework of time and space. Human population itself by nature undergo biological reproduction, however, because of its social relationships and involvement in the economic activity, it can also be linked with artificial subsystem and thus economic reproduction. This close intermingled of human population in the two subsystem can be separately called anthropoecological system. The system can be studied at various levels from an individuals to a human population as a whole.

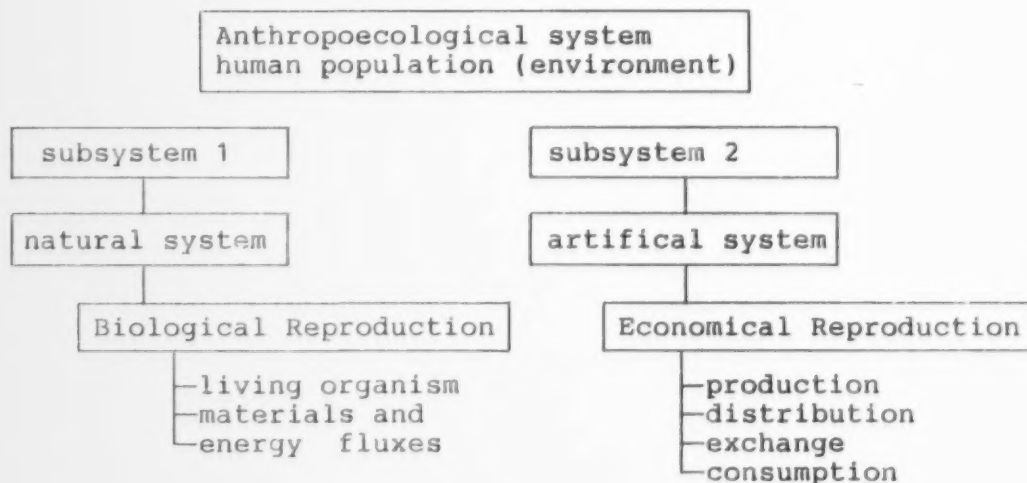


Figure 3 Conceptual Diagram on Anthropological System

At the beginning of his existence, man was involved in the natural processes as a biological species and virtually did not affect these processes by his activities. During the development of human society, man began to exploit and transform the natural resources of matter and energy by deliberate activity. The extent of this transformation is continuously increasing. A principal fact must be taken into consideration, that according to the law of conservation of mass and energy, all resource and energy taken from nature after transformation in the economical reproduction process in the environment in the form of waste. This constitutes the pollution phenomena.

IX. CHAPTER 6: ENERGY AND ITS USES

The following resume of Chapter 6 was presented at the workshop by Mr. Lee Chong Loui of ESSO Production Malaysia. Following the above resume a summary of workshop discussion with comments on Chapter 6 are also recorded.

A: RESUME

Since the beginning of history, man's energy requirement matches his level of civilization. Up till the year 1,000,000 B.C. his daily needs was only 2,000 calories. This slowly increased until around 1860, the beginning of the industrial revolution, when it increased sharply to 70,000 calories. The increase in energy requirement continues to grow exponentially. Man in this present day requires 230,000 calories daily.

Throughout the years, several energy sources were used. Wood was the primary energy source for more than a million years, producing heat for the preparation of meals and keeping houses warm. Then came energy derived from animals, wind and water. Coal was the primary energy resource during the industrial revolution and propelled the 18th century as the century of steam. The 19th century, also known as the century of electricity, witnessed an increasing consumption of coal as well as water energy. It too was the beginning of the exploitation of petroleum. This resource became such an important raw material in this century that it is sometimes called the century of petroleum.

Too great a dependence on this energy resource and its excessive exploitation together with a number of other events, created the energy crisis in 1973. As a result of this crisis, tremendous efforts were channelled towards energy savings, economic use of energy, and the search for new and non traditional sources of energy. It is expected for these new sources to play an important role in the future. A comparison between the energy sources to meet the present demand and that in the year 2000 (see Table 1) reflects their importance.

The following pages examine the various energy resources.

Coal

Coal is the oldest and was the most important energy source for man until oil and natural gas came into the scene. The switchover to the two cheap energy sources stagnated the coal industry. It remained so until the 1973 energy crisis when the steep increase in the price of petroleum products saw coal becoming economically viable again. (See Table 1)

With its origin from plants , coal obviously varies in composition and heat capacity. The main types of coal and their comparison with oil and gas in heating capacity and proven recoverable reserves are shown in Table II. Bituminous coal, which provides 53% of the world's proven recoverable reserves of fossil fuel and wood, is mainly for industrial use. Sub-bituminous coal has a lower heating value and is used widely for energy production and heating, especially in Europe. Both types of coal unfortunately have high ash and sulfur contents. The burning of large quantities of coal in Europe every year are primarily responsible for the high sulfur dioxide levels in the atmosphere of the northern hemisphere.

Lignite and peat are also used for energy and heating. However, they are not efficient because of their low heating value. Also, their high ash content is a concern to the environment.

Petroleum

Though it has been known to man since ancient times , petroleum has been a source of energy only since the second half of the 19th century . Petroleum (petra = rock , oleum = oil) is a heterogeneous mixture of gaseous , liquid and solid hydrocarbons . A certain amount of nitrogen and sulfur compounds are also present .

From a humble beginning in the early 19th century , its world production has increased by leaps and bounds to 3066 million tons in 1980 . This rapid increase is shown in Table III.

Petroleum and natural gas are formed mainly in the primary and tertiary geological formations. Though found in all the continents, majority of important deposits are located north of the 20 degrees parallel of the northern latitude. Of the world verified reserves, 81.2% of them are found in 10 countries. Their reserves as a percentage of the world's are given in Table IV .

Petroleum has become the primary raw material in the energy production, transport and the chemical industry. The increasing demand for petroleum caused considerable worries in the late sixties and early seventies that the reserves would be exhausted. This was one of the reasons for the energy crisis in 1973 and for the large increase in petroleum prices.

TABLE 1

World's Use of Various Energy Production Resources

Resources	Present TWh	Year 2000 TWh
Coal	2260	3930 - 4950
Petroleum	3620	4750 - 5890
Natural Gas	1510	2530 - 3110
Natural Energy	120	1290 - 1740
Wood	1000 - 2000	1500 - 2000
Charcoal	100	200 - 500
Peat	20	1000
Energy from Biomass	550 - 700	2000 - 5000
Solar Energy	2 - 3	2000 - 5000
Wind Energy	2	1000 - 5000
Geothermal Energy	55	1000 - 5000
Water Energy	1500	3000
Ocean Thermal Energy	0	1000
Dranght Animals	30 (India)	1000
Tar Sands	130	1000
Oil Shales	15	500
Ocean - current Energy	0.4	30 - 60
Tidal Energy	0	10
Total	10914 - 12065	27740 - 45760

1 kilowatt (KW) = 10^3 W1 gigawatt (GW) = 10^9 W1 Megawatt (MW) = 10^6 W1 terawatt (TW) = 10^{12} W

TABLE II

COMPOSITION AND HEAT CAPACITY OF FOSSIL FUELS AND WIND

Primary Sources	Carbon %	Sulphur %	Heat Capacity-power (MJ.kg ⁻¹)	Proved recoverable reserves (10 ⁹ tce)	%
Wood	50-52	0.10	16-18	-	-
Peat	60-62	0.5-1.0	19-21	5.8	0.63
Lignite	67-75	2.0-5.5	24	88.1	9.57
Sub-bituminous Coal	77-84	1.0-7.0*	25-30	111.6	12.12
Bituminous Coal	86-92	1.0-4.0	32-34	487.7	52.96
Anthracit	94	0.5-2.5	35	128.4	13.94
Petroleum	82-87	0.1-3.0*	42-48	99.3	10.78
Natural Gas	65-80	0.1-4.0	35-60		
Total				920.9	100.00

* Exceptionally up to 14 %

1 tce (tons of coal equivalent) = 29.3×10^9 J

1 t brown coal = 0.3 - 0.78 tce

1 toe (tons of oil equivalent) = 1.44 tce

1000 m³ " average " natural gas = 1.34 tce

1 Btu (British Thermal Units) = 1.05506 kJ

1 bbl (US barrel) = 0.15899 m³

1 kcal (kilocalorie) = 4.1855 J

TABLE III

WORLD PRODUCTION OF PETROLEUM

YEAR	WORLD PRODUCTION (10 TONNES)
1910	45
1930	197
1950	521
1960	1085
1965	1547
1970	2336
1975	2707
1980	3066

Source: Exxon Corporation , Public Affairs and Information
Department Hamburg, 1981 .

TABLE IV

PETROLEUM RESERVES

COUNTRY	% OF WORLD VERIFIED RESERVES
Saudi Arabia	25.8
Soviet Union	10.9
Kuwait	10.2
Iran	9.1
Iraq	4.9
United Arab Emirates	4.8
Mexico	4.6
USA	4.2
Libya	3.7
China	3.0

Their combined total tonnage is 72,406 tonnes .

Natural Gas

Natural gas has methane as its main component with ethane, propane, butane and other hydrocarbons present in smaller amounts. It has generally a low sulfur content (0.1 to 0.5%). Generation of sulfur dioxide during combustion is low compared to other fossil fuels.

The verified reserves total 98,700 million tons of coal equivalent thus far, and could, according to some, exceed that of petroleum. Although it has a higher heating value (see Table II), its price was substantially lower than that fetched by petroleum. It was only after 1980 that its price began to increase rapidly.

Oil Shale and Tar Sands

The economically exploitable reserves of oil shale are estimated to be 47,000 million tons of coal equivalent. Oil shale is normally mixed and heated to 450 to 480 degrees C. From one ton of shale, several to 480 litres of oil can be obtained.

The varified reserves of tar sands are about 57,000 million tons of coal equivalent. Tar sand deposits are mostly found in the northern hemisphere. It is formed from petroleum percolating into the sand close to surface, part of it being converted to asphalt by oxidation and through the loss of volatile fractions. It becomes economical to exploit if it contains 10 to 12% bituminous materials.

Nuclear Energy

The discovery of radioactivity at the end of the 19th century soon led scientists to realise that considerable energy can be obtained by utilising the decay of radioactive elements. Research work such as those by E. Fermi and his co-workers in the late thirties and early forties resulted in the development of nuclear arms and the use of nuclear energy for peaceful purposes.

After World War II, several nuclear reactors were built in the USA, Great Britain, Canada, USSR and France to demonstrate their practical use in energy production. As of 1980, there are 253 nuclear reactors with a total production of 136,000 MW electric energy in the world. Its importance as a generator of electricity is projected to increase (see Table V) and in 1990, nuclear energy is expected to contribute to about 13% of the world's electricity generation.

TABLE V

PROJECTED NUCLEAR ENERGY PRODUCTION

YEAR	UNIT (GW)
1975	76
1980	190
1985	300
1990	600
1995	1000
2000	1540
2005	2300
2010	3060
2015	4000
2020	5000

Thus far, most nuclear plants employ light water reactors. A major disadvantage of this type of reactors is the high uranium consumption. A more economical method would be the use of breeder reactors. They have begun to be employed this decade.

The basic materials for nuclear power plants are uranium and thorium. The world reserves of uranium and thorium have been estimated (IAEA) at 13.4 and 8.8 million tons respectively. In meeting the energy production in Table V and assuming a lifespan of 30 years for a power plant, the world reserves should be sufficient to last at least until 2020. The introduction of breeder reactors will conserve the reserves longer.

Secondary Energy Sources

The preceding discussions centered on energy primarily from fossil and nuclear fuels. With an estimated global consumption of energy doubling every 15 years in the second half of this century, the primary energy sources could be exhausted not very long in the future. This concern has led to intense search for secondary resources such as water, solar, wind and biogas.

Solar

The sun produces 3.9×10^{26} W of energy. The earth receives 751×10^{15} KWh of solar energy per year which is 25 thousand times larger than the total consumption of mankind. The beginning of history saw man using solar energy for heating his house and conservation of food. It was only in the second half of the 19th century that other possible uses for solar energy

appeared. For example, it was used in France in 1880 to drive a press for newspaper printing and for pumping water. Water pumps using solar energy were also demonstrated in the USA during this period. However, they could not compete with energy harnessed from fossil fuels because of the high cost although their operation was cheap.

Post World War II saw greater development in solar energy for low temperature uses such as heating of water for households. The state of the art is now practised widely in Europe, the USA, Canada and many other countries for providing hot water to households, schools, farms and the like. In some tropical countries, experiments have been carried out successfully in applying this principle to obtain portable water by distillation of sea or polluted waters.

There exists too the application of solar energy for high temperature appliances. For example, by using mirrors to concentrate solar radiation, portable gadgets for heating food have been constructed. On the same principle, such devices could be adapted for drying in agriculture, in the food industry, in making dried silk, etc. The development of the solar furnace in southern France in the early seventies led to the large scale generation of electricity via the production of steam. At present, several dozens of solar power stations are in operation. The systems, generally of low outputs, are suitable for pumping water for irrigation, production of steam for industrial purposes, production of electricity and heat for small and medium consumers.

The development of photo voltaic cells provides another means of harnessing solar energy. The initial high cost made it economically unattractive. Recent advancements in technology have lowered its cost to US\$500 for 1 KW of energy in 1986. Photo voltaic cells are presently used to power telephone, radio and television sets. They have also been demonstrated to drive boats, automobiles and ultralight aeroplanes. Apart from demonstrating their versatility, these demonstrations are currently of little practical value. Their immediate impact is to developing countries, especially in remote areas where photo voltaic cells are the sole provider of energy.

Research is continuing in several countries to increase practical utilisation of this free energy resource. In addition to technical difficulties, the main problem is that solar powered units are several times more expensive than those powered by fossil and nuclear fuels.

Wind

Just like solar, energy from wind has been exploited since ancient times. Use of wind to drive ships in ancient Egypt and Mesopotamia was reported more than 3,000 years ago. Windmills

were also reported to exist in Iran and the Arab countries during this period. Perhaps no other country used this form of energy as extensively as the Netherlands where there were more than 10,000 windmills by the end of the 19th century. They were employed to mill grain, pump water and drive all kinds of machineries. The advent of steam and later electricity saw to its decline in popularity in the 20th century. Only a few now survive as historical monuments.

The energy crisis of 1973 renewed interests in wind energy. It is estimated that total wind energy on earth exceeds 4.4 to 5.5×10^9 KW, which is about 500 times the present world requirement of electric energy. Technological advancements have improved the efficiency of wind powered stations. These stations are relatively cheap to operate and do not pollute the environment. However, it is very costly to build being in the region of US\$1,500 to 2,500 per KW. Another disadvantage is that wind is not regular and its velocity varies considerably. Also, nuisance could sometimes be created by the noise and vibration from wind powered stations. For example, television screening has been reported to be disturbed.

Several dozens of large wind powered stations are in operation and can supply 30 to 50 family houses with electricity. Because wind is not a daily content resource, its practical applicability could best be promoted by using wind powered stations in combination with other forms of energy.

Water

Water energy is one of the oldest forms of energy available to man. This could be exemplified by a description by Vitruvius, a Roman architect, in the 1st century B.C. of a bottom driven water wheel with gears and yielding a relatively large output. Water wheels at one time were the prime mover of machines besides windmills. The emergence of steam engines at the beginning of the 18th century heralded the disappearance of the water wheels. However, it reappeared again when in 1881 the first water power station was built and lighted an exhibition in Frankfurt. Water power stations are cheap to operate and have a long lifespan (sometimes even 100 years). The construction of reservoirs to supply water to the power stations, helped in flood mitigation, and permitted irrigation, fishing, recreational activities, etc.

Approximately $40,000 \text{ km}^3$ of water flow to the seas. Based on an average height of 800 m for the continents, the total energy of the rivers is 10×10^6 MW which is the present world energy requirement. However, because the upper and lower parts of the rivers cannot be utilised, the potential energy that could be generated is only 10 to 17% of the total amount. There are currently more than 70 hydropower stations with an output exceeding 1,000 MW, the largest being that at the border of Brazil and Paraguay which is designed to generate 12,600 MW.

In addition to these large hydropower stations , small ones with the capacity of 1 to 10 MW , are increasingly receiving attention . At a price of US\$800 to 1,800 per KW, and with the maintenance and operating costs estimated to be less than 5% of the investment per year, these small hydropower stations have become competitive with increasing oil prices.

Sea Water

Sea water can provide electric energy either from tides, waves or streams or from temperature differences between surface and deep water. The use of tides is most developed and was used as early as in the middle ages to drive mills and wood saws.

The total energy from tides is estimated at 3×10^{12} KW but only about 2% can be used. Tidal power stations require a difference of 6 to 8 m between low and high tides.

Geothermal

Geothermal energy, for practical purposes, is defined as thermal energy of the upper part of the earth's crust to a depth of 4 km. It is used in places where geological anomalies permit the penetration of hot water or steam to the earth's surface. For example, 90% of the living houses in Reykjavik are heated with geothermal water.

Industrial use of geothermal energy started in Italy in 1904. There are now almost 100 geothermal power stations in operation in 13 countries with a total output of 2,450 KW. The majority of them are located in the USA (17), Philippines (10) and Italy (37).

Energy is generated from geothermal sources in the form of steam, hot water or a combination of both. From the environmental viewpoint, geothermal power stations are more advantageous than those using fossil fuels. However, they too have an impact on the environment. Wastewater from these stations are rather warm and could be highly mineralised. Their discharges into rivers with low flow rates could upset the rivers equilibria. Dissolved gases such as hydrogen sulphide may also pollute the environment.

B: DISCUSSION

During the discussion , it was pointed out that the use of diagrams and illustrations were sorely lacking in the chapter. This should be included to give a better picture of the contents. There were some doubts as to how TABLE 6.1 was obtained, especially with regards to the projected production. It was suggested that the means used to arrive at those figures should be explained. Also, the tables and data used were outdated (e.g. the 1980 data) hence, they should be updated.

The statement on page 322, that is....'This is one of the reasons for the petroleum energy crisis in 1973 and for the large increase in the petroleum price'... is felt to be inaccurate and therefore should be changed.

Sections 6.3 and 6.4 are missing in the chapter. They should be duly added as the subjects they touch upon are very important. With regard to these sections, it was suggested that a mention on the South - South cooperation be made for example on the biogas utilization projects.

Aspects regarding the usage of energy (e.g. end use in the form of electricity) were poorly covered, and thus should be discussed more extensively. Also, new energy possibilities should also be stressed in the chapter. It was felt too that examples regarding energy uses as quoted in the chapter are mainly taken from the developed nations. Therefore, there should be a balance in the quoting of examples to include both from the developed and developing nations. There was also a further suggestion that energy conservation should be elaborated in the chapter.

The use of per capita GNP was hardly touched. Its use should be emphasised as it is an important parameter when discussing the economic aspects.

Several words/statements used are sometimes too technical and 'high-level'. These should be avoided, or if used, definitions must be given.

Environmental consequences resulting from the extraction and uses of energy sources were not covered sufficiently. Due attention should have been given to them. Further , it was suggested that a section on environmental implications of energy production and use should be added.

It was also suggested that more basic material be added in the chapter to make it easily understood for the general public. For example, elements of basic mathematics should be introduced, especially with regard to the derivation of the data, to give a better understanding of the chapter . However, it was made known here that the sourcebook is actually for use by key-personnel . It is they who should be able to digest the contents of the

sourcebook , and then impart whatever information necessary to the public in a way they see most fit . Hence , the sourcebook acts as a facilitator .

There was scant mention of the use of biogas as well as some 'unique' energy consumption practices of developing countries. More over, emphasis was placed on the consumption patterns of the developed nations. Therefore, it was felt that stress should be given to energy practices of developing countries e.g. use of firewood, biomass and human energy .

The sourcebook, in general, does not place due attention on the 'how' aspects . As this is one of the objectives, it should be stressed here e.g. how to transfer the facts and concepts obtained in the sourcebook to the target groups.

Lastly , there was a suggestion that the chapter should be circulated to the participants to get their input. However, it was felt that this might not be a good move as the participants concerned are not experts in the fields mentioned in the sourcebook. Hence, it was recommended that UNESCO should directly contact the respective governments which, hopefully, will provide the 'right' people to review the various chapters.

X. CHAPTER 7: DEVELOPMENT

The following resume of chapter 7 was presented at the workshop by Ms. Chee Yoke Ling. of University Malaya, Malaysia. Following the above resume a summary of workshop discussion with comments on chapter 7 are also recorded.

A: RESUME

The Chapter is divided into six main parts:

1. The concept of all-rounded or sound development ;
2. Practical principles of environmentally sound development;
3. Factors in environmentally sound decision-making;
4. Development and environment compatibility in the light of short and long term objectives; and
5. Implications of the above contents for the activities and decisions of the target group towards achieving environmental education objectives;
6. Suggested environmental actions and legislation concerning the above subject.

The Concept of All-rounded or Sound Development

The complex relationships between all living things and the natural environment, and among living things themselves, exist and evolve through the flow of information. This information comes in different levels, having a cause and effect impact on the entire ecosystem.

The development of any system takes place when substances and energy from the natural environment are transformed and adapted for use by man. As the level of information increases, uses of substances and energy resources become more effective. Of all living organisms, man has exploited ever greater amounts of such resources at increasing levels. However, this has been done at the expense of the natural environment. We have had "revolutions" in the use of natural resources, especially energy - examples are the agricultural, industrial and scientific-technological revolutions. Unfortunately, these have resulted in increasing disturbance of the natural environment, and also tremendous wastage of resources. For instance, in economic production only about 4 - 9% of the natural substances used are separated during the production process in the form of various wastes. The products themselves also end up as wastes. Therefore, growth of information on the possibilities of resource exploitation has a great potential for further development of natural resources. The scientific-technological revolution is thus important for overcoming the present ecological crisis.

It is clear even now that economic production and biological reproduction are interdependent processes. The volume of mass is limited by the volume of the earth. The input of energy is constant. Space and time are limited. The only factor that can increase in the global system is information. It is by increasing the information level that the use of resources can occur without deepening the ecological crisis. This is the only hope of mankind for its survival.

Practical Principles of Environmentally Sound Development

Three principal levels must be considered in the growth of knowledge to formulate a solution to the ecological crisis.

a) At the technical and technological level, science must aim at preserving and extending the reproduction capacity of natural resources. It must also prolong the exploitability of non-reproducible (non-renewable) resources and the utilisation of reproducible energy. This is to ensure that the resource base for socio-economic development can be preserved, and that waste from such development may be minimised.

Where reproducible (renewable) resources are concerned, it is necessary to use biological and ecological knowledge to preserve and develop these resources. Examples are agriculture, forestry and water.

Agriculture

The present agricultural technology in industrialised countries is based on high mechanisation, chemicalisation, concentration and specialisation of production. This results in high demands on irreproducible energy from fossil fuels, and on the exploitation of irreproducible natural resources. These technologies also often interfere with the natural reproduction processes, cause erosion and chemical pollution of both waters and produced foodstuffs.

A more ecological-conservationist approach is needed. Recycling should be maximised; erosion can be battled by growing windbreaks. The latter can also be a sanctuary for animals and birds which can help in the natural fight against agricultural pests. This would reduce the use of chemicals as well as decrease their negative impact on the environment.

Scientific knowledge should be developed to produce food more efficiently as well as increase the productive kinds of foodstuffs from the genetic pool. Solar energy and biogas should be used more effectively instead of straining fossil fuel supplies. All these stem from improved levels of information.

Forestry

In addition the production of wood, the forest plays an important role in water economics and anti-erosion processes. It also produces oxygen, contributing to ecological stability. It has a recreational and aesthetic function, too.

Large parts of forests in the northern hemisphere is endangered by industrial emissions, while tropical forests suffer from large-scale logging. This destabilises climate and the ecology, the water economy and thus also the agricultural and industrial utilisation of the forests. Therefore, forest management with emphasis on long term effects is necessary.

Water Economy

Although the earth contains of an immense amount of water, the larger portion is sea water and polar icebergs. The theoretically useful water amounts to only 0.6% of the total amount. Distribution of water is uneven. Incidence of rain also varies from one area to another. In areas where water supply is regular, people do not treat water economically. The main harmful effects are water pollution by industrial, household and agricultural waste. Rivers, coastal waters and beaches face disappearing life. At the same time, demands for good quality water are constantly growing - in industry, agriculture and households. Preventive cleaning of waste waters is necessary to secure future needs for clean water and to preserve life in the rivers and streams.

Where irreproducible resources are concerned, higher levels of scientific knowledge can be attained which will utilise a low consumption of raw materials and energy in the production process. The Japanese experience is a case in point.

Another possibility lies in substituting deficient resources with no-traditional resources of raw materials and energy. Thus we can reduce the dependency on oil and its derivatives, both in direct use and in the creation of "artificial" materials. The development of knowledge permits the use of other natural materials, and the application of new production procedures enables utilisation of materials that have seemed to be uneconomical, inaccessible or impossible to use. This experience is not new: the exhaustion of copper, for instance, necessitated the search for another metal, which was found to be iron. The condition for its treatment was a change in technology (i.e. the growth in knowledge) based on an increase in the smelting temperature. This change led to the transition from the bronze age to the iron age.

Substitution of resources will eventually take place as the increasing costs of the original resource meet the decreasing costs of the new resource. Increased costs of fossil fuels and depletion in supply should stimulate research to find more economical technologies, and for non-traditional properties of various natural resources. An example is the use of silicon in electronics.

A large percentage of the natural resources end up as wastes, causing environmental pollution. This amount can be decreased by using part of it as secondary raw materials. A basic condition for recycling is selection of wastes at the site of origin. This is particularly true of industrial wastes which should be stored separately right from the production stage, to facilitate its maximal reuse in the production point, or transfer to other productions.

For example, communal wastes contain almost 1/3 of recyclable kitchen wastes that could be used as feeds or for composting. However, the present technologies for treatment and utilisation of wastes are not efficient. Recycling of secondary raw materials is still at a relatively low level the world over.

Nevertheless, the process is important for it prolongs the exploitability of irreproducible resources.

While low-waste technologies can be developed and improved to maximise utilisation of resources, there will still be a certain amount of waste from the production process. Thus it would be desirable to deposit present wastes in selected places in an ecological manner, so that it will not harm the environment and can be used in the future. Wastes which cannot be rationally stored in this way must be ecologically treated and dumped in such a way that they will not endanger the environment. This applies particularly to toxic wastes.

It is paradoxical that while resources are depleting and prices escalating, product lifetime is shortening. The "throwaway" consumer culture and inbuilt obsolescence based on fashionability have created wasteful consumption patterns. Developing countries seeking to emulate this lifestyle also strain their resource base, as well as damage their environment.

b) At the level of time-space relationships, energy resources must be optimised in the landscape and in time with respect to their velocity.

First, optimisation is related to the structure of inhabitation. In other words, urbanisation. This process grows with increasing population and with increasing industrialisation. Large urban areas cannot be sustained without enormous supply of substances and energy, and the production of enormous amounts of wastes and waste heat. The materials and products are supplied from distant places at high speeds, e.g. by air. This involves high energy consumption. People are also transported over long

distances - to work, for recreation, etc. Thus, urban planning must take into account the level of energy consumption. The size of towns and cities must relate to the environment, scattering or concentration of industry in terms of material transport and the transport of people, utilising the given structure of the community.

Secondly, in the utilisation of the landscape, man has depleted the biomass to the extent that he must resort to "External" excess energy and substances in the form of industrial fertilisers. Monocultures and specialisation in modern agriculture further decrease the diversity and stability of the environment. It also demands more energy and material inputs. More knowledge is thus required to optimise processes in the landscape which would lead to higher stability and reduce energy consumption.

c) At the socio-economic level, a number of causes prevent a more rapid introduction of ecologically suitable technology and approaches. These include a lack of ecological thinking among the public, and among economists and politicians in decisive posts; the inertia of the economical reproduction process; the specialised approach to problem solution and economic evaluation which ignores the wider societal context; the notion that "Nature is free of charge" caused by the failure of economic theory to express the value of resources, wastes or even the value of biological reproduction itself; and the lack of appreciation of the environment as an inseparable part of the standard of living.

In order to seek solutions at this socio-economic level, we must look into the fields of political economy, economical politics and political decision-making. The first would develop a theoretical basis for a dynamic approach to development which takes into account the relationships between economics, social factors and the environment. The second is important for it deals with the tool for the realisation of development aims, which in turn are themselves determined by political decision-making. The latter is based on a hierarchy of evaluating and value criteria for particular stages of development.

Decision on short and long term aims of socio-economic development are based on the knowledge of the needs of development on one side, and on the knowledge of the limiting factors on the other side. Information on adaptation mechanisms to overcome the limits is also essential.

Since natural and social conditions change over time, with variations in technologies as well, all long-term decisions must be constantly evaluated.

Furthermore, the basis for the development of alternatives is the integration of the knowledge in natural and social sciences. Only when this is done can the decision-making process be truly effective in achieving ecological development. In this respect the society should formulate its development aims, not

for a quantitative, consumer type of consumption, but toward a higher quality of life. The environmental approaches to this position should be introduced as soon as possible to give them the appropriate place in the hierarchy of decision-making values.

Factors in Environmentally-sound Decision-making

The concrete implementation or ecologically correct development is subject to the acquired level and orientation of knowledge and awareness, man's attitudes toward the environment, and the uneven development of the human population.

The entire development of man is linked to the transformation of his environment through working with the knowledge and understanding and thinking which he possesses. His environment and his activities, his needs and his desires have all conditioned a continuous creative process of acquiring deeper knowledge and utilising it. These provide man with more efficient tools to affect the environment and to further influence his life. In recent years this process has accelerated in an unprecedented manner resulting in an exponential growth of information and of its practical use. This has had a major effect on man's relationship with the biosphere.

The emphasis on the physical and chemical aspects in science, research and practice (leading to efficient technologies and higher production, productivity and consumption) was projected into the education system. The result: a one-sided science education which equated instruction in physics and chemistry to science education, ignoring knowledge about living nature. This approach is especially true of secondary school education.

The level of cognition which has been attained in physics and chemistry suffices for the global and total destruction of relationships between man and his environment. The manifested negative consequences of changes in the environment, especially the chemicalisation of the environment and physico-technical development, are having significant impact on man's increased interest in the development of biology, the cognition and the use of information which allow and preserve the existence of life. More information will be needed to establish a harmonious man-biosphere relationship than for the destruction of that relationship. Interest in the study and research of living nature signifies the development of new trends in physics and chemistry, new methods of applying mathematics, higher demands on technical equipment and on new technologies which may be used to acquire the required knowledge about life. Both natural sciences among themselves, and natural sciences with technical and social sciences, must be integrated to bring about the desired changes.

The increased orientation towards the cognition of living nature will be ever more explicitly projected into general and specialised education.

Man's impact on the environment is also conditioned by his attitudes. People do not usually consider the side effects of their activities, and often do not even realise the connection between their activities and various negative changes in the environment. The need is becoming urgently manifested of a higher level or method of thinking and behaviour which would take into consideration the negative impacts on environment caused by man's activities. This will enable a correction of wishes and needs, and a formulation (determination) of tasks and methods and procedures for activities. The ecological aspect must penetrate man's attitude towards the environment. The essence of this aspect is the introduction of the principle of feedback into the thinking, feeling and behaviour of people. This will allow the continuous restoration of the continuously disturbed equilibrium.

The introduction of the ecological aspect into all intellectual and work activity is closely linked with the manner of education. We must strive to achieve a harmonious development of the human personality, especially the need to depart from unnecessary and irrational consumption. Man must become aware of the values of life and his own position in nature, the interactions between himself and his environment on a long-term basis. The formation of ecological attitudes is a very long, gradual and complex process. It is all the more important to take the first steps for this is a task of the present for the future.

Lastly, the uneven development of the human population has resulted in different types of states: be it from the economic, technological, scientific, cultural or ideological point of view. These and other related differences are significantly projected into the situation of the human environment on a global, regional and local scale.

In economically advanced countries and areas, environmental problems are often primarily linked with tumultuous economic development, high energy and material consumption, intensive chemicalisation, etc. In developing countries, they are mainly the result of rapid population growth, inadequate economic development, lack of water, energy resources, deforestation, soil exploitation, etc.

The negative impacts of such unevenness in development are:

i) war and armed conflicts which destroy human life and the entire environment with the use of new physical, chemical and biological weapons;

ii) preparations for war , i.e. armament and all related activities which considerably draw on the financial, personnel and material resources needed for the solution of environmental problems; large areas used up for military exercises which also devastate nature;

iii) exploitation , unemployment , poverty which polarise interpersonal relationship, concentrate attention solely on the solution of vital, immediate basic needs of the people, thus precluding the rational approach from being taken to solve man's relations to the biosphere, hampering the improvement of a considerable of the human population;

iv) the exploitative attitude to nature based on traditional socio-economic principles, hampering the rational utilisation of resources based on ecological principles which bring long-term advantages;

v) illiteracy and lack of education which precludes the development of ecological values and measures for the improvement and protection of the environment.

However, there are also positive factors which create the preconditions for the formation of rational responsible attitudes to the biosphere:

i) the endeavour for preserving peace and disarmament in order to remove the potential danger of complete human devastation, and the endeavour for releasing resources to solve environmental problems;

ii) the struggle against exploitation and poverty aimed at eliminating the basic social conflicts hindering the societal planned control of man's relationship with the environment;

iii) the development of education and culture which also strives for the development and enforcement of ecological values and attitudes in the majority of the population;

iv) the development of science and technology ,the process of the integration of the sciences which is aimed at establishing harmony between man and nature, at introducing a higher measure of information into the further process of scientific and technological development;

v) international cooperation at different levels of the development of knowledge aimed at contributing to the solution of global problems.

All the factors, negative and positive, are interlinked.

Development and Environment Compatibility in the Light of Short and Long Term Objectives

It is clear that the problems of man's relations with his environment is currently polarising and require speedy, well-conceived and responsible approaches to solution. The essence of this solution is the all-round application of a higher measure of information.

The fundamental long term goal in development must be the establishment of harmony in man's relation with his environment. Ecological principles must penetrate all fields of knowledge, in the intellectual area as well as in the sphere of ethics and the entire development of the human culture. Meanwhile, the urgency for immediate action requires the speedy fulfilment of short-term concrete goals. These are an integral component of long term objectives.

Short term goals include:

- a) limiting the deterioration of the environment and improving the situation, especially in the most seriously affected areas;
- b) limiting and halting the irrational and excessive exploitation of natural resources : this is mainly the problem of economising with raw materials and energy;
- c) reducing conflicts in man's social environment : this concerns the struggle against poverty, disturbance of the environment inflicted by spontaneous and tumultuous urbanisation.

All these goals are very closely related to the endeavour to preserve peace. They also require activities from individuals and diverse groups of varying sizes, ranging from the state to various organisations and institutions. Some of the short term tasks are already underway today.

Short and long term objectives of environmental control may be attained primarily through several fundamental social instruments which are inter-related and mutually conditioned:

- a) Scientific, technical and technological research: the results allow the practical solution of individual environmental problem areas, with immediate effect on environmental quality;
- b) Legislative and legal measures , organisational and administrative measures : these significantly control the behaviour and actions of people towards the environment, and contribute to the implementation of ecological approaches in production and decision-making. What is more important, of course, is their observance and implementation in the life of society. This would involve the responsibility of lawyers, organisational personnel, administrative staff, etc.;

c) Economic instruments of environmental control are vital in forming an understanding and acceptance of an "ecological economy". Evaluation of economic advantages must not be confined to short term gains, to the extent of ignoring the disadvantages which are caused by irrational and excessive exploitation;

d) Environmental education has primary importance with regard to the implementation of short and long term objectives of healthy ecological development, even though its effect on environmental quality is not always evident at first sight and is often indirect. It is manifest through the results of science and technology, through legal and legislative, administrative, and economic measures.

In the end, all depends on man and his level of knowledge, his attitudes and values which determine the choices he makes with regard to his relationship with his environment. All depends on man, as a unit and individual, and especially as a member of society whose cultural, economic, political and organisational foundations define the overall approach to environmental problems.

The complexity of developing new ecological values and attitudes demands that it must be based on systematic inter-related formal and non-formal education. The school as the sole educational institution may have long-term, organised and systematic impact on the whole society and therefore has the key position in environmental education. Non-formal education may selectively respond to the interests, abilities and needs of individuals, stimulate and develop their activities, deepen and broaden information, act deeply on emotions. Environmental education must penetrate the entire traditional system of education and at the same time, establish a qualitatively novel level of cognition in the form of a synthesis based on the principle of mutual relations, purposefully oriented to practice, to man's active attitude towards the environment.

Implications of the Above for the Activities and Decision of the Target Group Towards Achieving Environmental Education Objectives

Ecological development will require the implementation of measures in the education of children, youth and adults. Influencing the adult population is important for short-term targets, while long-term goals will require attitude-formation in children and youth .

Certain characteristics of environmental education are:

- a) close linkage with the attained level of social development and knowledge ;
- b) multi and inter-disciplinarian approach;

- c) the complex concept of man's relationship with the environment;
- d) emphasis on "feedback" thinking which allows visualisation of long-term consequences of man's actions;
- e) significance of solving ecological problems with regards to the interests of society and the formation of responsible attitudes to the environment in each individual ;
- f) long-term nature of educational impact in forming attitudes which will require permanent influencing of the person through all levels of formal and non-formal education ;

In forming civic attitudes, there must be basic knowledge of the environment, man's impact and the resultant impact on man himself, and the basic methods of solving the problems. Forming desirable professional attitudes will require knowledge of the impact of one's respective field on the environment, possible ways of limiting or eliminating the negative impacts and possible ways of using one's field to resolve the problems.

Implementation of Ecological Education for adults

- a) Publicity on the ecological approach to raise interest and awareness: the mass media, public and hobby organisations have important roles;
- b) Gradually completing the foundation of complex ecological education so that people realise their own responsibility and society's responsibility for the environment: educational programmes in the mass media and educational institutions, including lectures, discussions with audio-visuals, exhibitions, etc.;
- c) Upgrading the professional education through special courses, lectures, training activities, seminars, etc. oriented to various areas of environmental problems; this would cover production, consumption, control, decision-making and management;
- d) Special training of specialists on a long-term basis for secondary school, university or college graduates.

An important form of stimulation, especially for systematic forms of adult education, is the development of societal readiness to solve environmental problems.

Implementation of environmental education for children and youth:

- a) a school-based system running through all types and levels of the school system, in vertical continuity and horizontally coordinated, comprising general and specialised education. The implementation of such a comprehensive system would require

fundamental changes in teaching methods, materials and teaching aids, and the education of teachers themselves;

b) varied out-of-school activities of children and youth following on school-based environmental education. This would stimulate and develop interests and aptitudes. The development of this non-formal education depends on hobby leaders, instructors and other people involved in youth activities. Of significance is the exchange of information and the use of this data at different levels of education, at local and international levels, too.

Suggested Environmental Actions and Legislation Concerning the Above Subject

The following areas are important in preparing the necessary pre-requisites for formation of ecologically correct attitudes:

a) Pedagogical research: this is mainly concerned with the development the theoretical basis of appropriate syllabi, curricula, teaching and learning aids. Very important is the concept of vertical continuity and horizontal coordination in school as well as the linkage between formal and non-formal education, and the specific tasks of adult education. Such research will involve researchers and teachers in mutual cooperation.

b) Transfer of information : this will be from the diverse levels of science, research and practice to the field of education. There will also be evaluation and processing of the transfer. The field of education may have retroactive effect on the stimulation and orientation and development of cognition, and possibly on practical solutions in the field of environmental control. This concrete cooperation between theory education and practice will require close cooperation among scientists, field practitioners, teachers and others from non-formal education sectors.

c) Legislation: this concerns the implementation of the results of pedagogical research of environmental education by elaborating the necessary pedagogical norms and documents. Complex teaching units will require incorporation into the curricula for the different educational researchers and the school administration, especially the ministry of education. The extent society places demands on environmental issues will influence the level of research, and particularly the implementation of environmental education.

d) Material and technical base of environmental education: this concerns the provision and means for the implementation of environmental education at diverse levels, namely the publishing textbooks, guidelines and instructions for practical and hobby activities, special information publications for children, youth

and adults, audio-visual materials, the establishment of special centres for environmental education, etc. Again, the cooperation of educationists, practitioners and experts from other fields such as film-making will be necessary.

g) Organisation and personnel for environmental education: task related to teacher training and to the training of other educational personnel undoubtedly rank first. Both pre-graduate training and training of serving teachers need upgrading. This is a complex task since the teacher influences the attitudes of his pupils to the environment by his whole personality. The teaching profession itself must be moulded on ecological principles, stimulating teachers to be creative and to exchange experiences among themselves. Inter-subject relations in the school, and relations between formal and non-formal education must come to the force. For the implementation of these intentions it is important to build a certain organisational basis. Very important is the setting up of various specialised coordination centers for environmental education on a territorial basis, e.g. town-based, region-based, centers which coordinate school and out-of-school environmental education. Activities can also take place on the international level.

B: DISCUSSION

It was commented that the chapter is incomprehensible, lacks persuasion, case studies and examples on the effects of development on the environment.

It was suggested that the author should define the word development on various aspect, since the word has different meanings to different working groups. As it is written, the chapter lacks conceptual and social definition but emphasized on economic and technological aspects. And, the author should also discussed the indices of development in the chapter.

The following is a suggested outline for the chapter :-

Part I : What is development

- a) Concept of development
- b) Various models of development
 - 1) Sociological
 - ii) Economical
 - iii) Physical
- c) Ideal model of development

Part II: Indices of development

- Environmentally sound development

- Implication for non-formal environmental education

Other comments made on the chapter are as follows :

- i) the author used terminologies which are not in common usage.
- ii) the chapter should be in conformity with all the chapters in the Sourcebook.
- iii) section 7.4 - Production and Consumption Pattern was not mentioned in the chapter and only a generalised statement was made on section 7.7 - Suggested Action Legislation.

XI. CHAPTER 8: ENVIROMENTAL ETHICS

The following resume of Chapter 8 was presented by Dr. Mohd. Ismail bin Yaziz. Following the above resume a summary of workshop discussion with comments on Chapter 8 are also recorded.

A. RESUME

The Concept of and Need for Environmental Ethics

Ethics proper may be conceived as those rules and principles which are not formally encoded or formally punished, but which are , nonetheless , recommended and sanctioned by social approbation and disapprobation. Ethics thus lie as the basis of laws and complement and supplement the laws. They are culturally (and sometimes personally) generated and sanctioned.

An ethic therefore constitutes an ideal of human behavior. As such, it is never completely realized in practice but it measurably influences actual behavior. It exerts a persuasive influence on actual behavior and a norm in reference to which actual behavior may be evaluated.

Just as social ethics impose restraints on human behavior in relation to other human beings, an environmental ethic would impose restraints on human behavior in relation to the natural environment. For example, in many countries laws have relatively recently been enacted to prevent the littering of public highways, parks, and other publicly owned land. One may still however, litter one's own property. An environmental ethic, however, might discourage one from doing so. An environmental ethic is desirable because some forms of human behavior are destructive to the environment as a whole or to it's components or both.

Neolithic, ancient, and medieval and modern agriculturalists has caused soil erosion, siltation of surface waters, deforestation, salination of both arable and fresh waters and desertification. Industrial civilization has polluted the environment with synthetic toxic chemicals and radioactive elements, as well as intensified the kinds of destruction already apparent in the activities of preindustrial man. Clearly an environmental ethic is needed to curb these human abuses of nature. However, a reexamination of human history reveals the existence of culturally evolved and integrated environmental ethics which served to limit the environmental impact of pre-industrial human technologies.

For example : In some traditional cultures nature was everywhere represented as enspirited and divine and therefore the direct object of reverence ; in others it was the creation of God, to be used with care. (A more systematic discussion of these traditional environmental ethics is undertaken in the next section). Ironically, the emergence of global industrial human culture was accompanied by a loss of these pre-industrial environmental ethics. The secularism, materialism, and humanism characteristics of industrial culture undermined all such earlier environmental restraints and evolved no alternative environmental ethic peculiar to itself.

Approaches to Environmental Ethics - Anthropocentrism and Biocentrism

Contemporary industrial culture has evolved a social ethic popularly known as 'utilitarianism' in which equal consideration is given to the welfare of each individual human being (with all other natural beings understood to have only instrumental value). Using this approach, a modern secular environmental ethic could be developed which takes into account the impact of human actions on other human beings. Then, by reference to the general principle of utilitarianism, supplemented by generally accepted norms or standards of human rights, human environmental behavior could be ethically evaluated. This approach may be called an anthropocentric environmental ethic.

For example : Massive deforestation of a country, which directly destroys a forest ecosystem, may indirectly adversely affect the people of that country or of another country because of the now well-understood climatological, hydrological, and erosional effects of deforestation. Thus massive deforestation would be unethical because it would purchase benefits for a few people at a greater cost to many.

Another more direct approach to environmental ethics would be to regard as morally accountable the effects of human actions directly upon the non-human natural entities collectively or individually irrespective of their indirect effects upon human welfare. This approach may be called a biocentric environmental ethic. Thus a biocentric environmental ethic would morally censure such a case of deforestation as mentioned previously even if the region was so remote that the more far reaching environmental impact of its deforestation on human being was negligible.

Environmental Ethics in Historical and Cultural Contexts

a). Western European

1. Judeo-Christian

There has been intense controversy about the environmental attitudes of the Judeo-Christian tradition. Environmental critics of Genesis have claimed that since, according to Genesis, Man is created in the image of God and given dominion over nature and commanded to subdue the Earth, Genesis clearly awards man a God given right to exploit the Earth without moral restraint. Thus if God is lord and master of Man, so Man is the lord and master of Nature. This may be called the mastery interpretation of Genesis. If this is the correct interpretation, then it would seem that the only environmental ethic compatible with the basic Judeo-Christian view is some form of weak, indirect, anthropocentric environmental ethic which would prohibit the abuse of nature only if such abuse adversely affected human welfare.

Judeo-Christian apologists have contested this interpretation of Genesis and the untoward environmental ethical implications drawn from it by critics. Man's unique essence, to have been created in the image of God, confers also special duties and responsibilities. Paramount among Man's responsibilities is his responsibility to wisely and benignly rule his dominion, the Earth. To abuse, degrade, or destroy the Earth is to violate the trust God placed upon His viceroy (Man). This interpretation may be called the stewardship interpretation of Genesis. The stewardship interpretation is reinforced in preceding passages in Genesis where God had declared each successive part of his creation to be "good" thereby apparently conferring inherent or intrinsic value (i.e. more than merely instrumental value) on non-human natural entities and Nature as a whole.

Another interpretation of the creation myths in Genesis may be called the citizenship interpretation of Genesis. In this interpretation, Man's acquisition of self-consciousness and with it self-centeredness was the result of eating the fruit from the tree of knowledge. When Man acquired the divine knowledge of good and evil, he began to evaluate parts of the creation in relation to himself. He nurtured the anthropocentrically "good" parts of nature and attempted to destroy the "bad". This upset the balance and order of nature as a whole, as God had created it and as He wished it to remain. Hence God thus drove them out of Eden. Man's salvation thus would seem to consist in a return to innocence, nakedness, and reimmersion in nature. This interpretation of the creation myth of the Judeo-Christian tradition implies that even Man's benign stewardship of nature is wrong because stewardship would involve self-conscious judgement.

While both the environmental ethics associated with stewardship and citizenship are direct and biocentric, they differ in their practical implications. The former would permit benign management of Nature and wise use while the latter would imply a live-and-let-live approach, incompatible with the present civilized condition of mankind. The environmental ethic associated with stewardship is, thus, both the most practical and the most acceptable interpretation consistent with the Judeo-Christian tradition.

2. Greco-Roman Historical Roots

Hesiod's Theogony was to the ancient Greek religion what Genesis is to the Judeo-Christian religious tradition. In sharp contrast, however, the Theogony represents the world as procreated. Heaven and Earth joined in sexual union and Earth gives birth to the first generation of gods. Among these divine beings are massive features of the natural environment - the sea, time, mountains, and so on. They are, therefore, sacred in and of themselves. In sum, then, according to pagan Greek mythology, the environment comes into being by an essentially organic process, it is sacred, and human beings are an integrated part of it.

Perhaps because Hesiod's account is so fabulous and incredible, or for some other reason, belief in it gradually eroded. Environmentalists seeking a foundation for environmental ethics in ancient Greek philosophy have cited the philosophies of Heraclitus and Pythagoras as models.

According to Heraclitus, this dynamic world is orderly - regulated by something Heraclitus called Logos. Heraclitus' very general description of the world roughly corresponds to natural ecological cycles in which organic things comes into being only to be metabolized and transformed into other things as the materials that compose plants are eaten and transformed into animals. The global ecosystem is kept alive and dynamic by a constant flow of energy from the sun. Heraclitus may fairly be said to have proposed an ecological world view, a dynamic but balanced system through which there flows a current of energy (fire).

Pythagoras believed in the transmigration of souls from human beings to animals and from animals to human beings - thus his related prohibition on eating animal flesh. According to Pythagorean doctrine, the soul is a fallen divinity, incarcerated or entombed in the body. According to Pythagorean doctrine, one's aim in life is to live as purely as possible in order to transcend earthly existence. Pythagorean vegetarianism, celibacy, and other ascetic practices were undertaken precisely to avoid the necessity of the soul's future participation in earthly processes. Only thus could the soul become liberated from the necessity of reincarnation.

This essentially dualistic concept of human nature - a divine soul in a mortal body - became a cornerstone of the later philosophy of Plato and because of Plato's enormous influence, it became virtually institutionalized in Western culture and civilization. Meanwhile, developments in the Greek philosophy of nature led to the culmination in the atomic theory of matter. According to this theory, all manifest material objects are divisible into component atoms and the atom's themselves are indivisible, solid particles. Since the primary characteristics of atoms are amenable to mathematical expression, all natural processes therefore could, in principle, upon this theory, be described mathematically. The resulting concept of nature was, thus, inert, materialistic, reductive, quantitative, and mechanical. The world-view according to Greek philosophy is, therefore, one in which nature is essentially profane and mechanical, while Man, because of his soul, is essentially divine and metaphysically distinct from nature. This suggests that the environment can be radically rearranged and transformed with impunity, while Man's separateness and superiority suggests that he has both a right to do so and a dissociation from the consequences of doing so. The Greek philosopher Aristotle was neither a dualist nor a mechanist but his teleological and hierarchical picture of the world-order understood the environment to be at the service of man.

Thus, the tradition of Heraclitus might be of some use for the development of an environmental ethic, but on the whole, they are submerged by the more dominant mechanical, dualistic, and hierarchical philosophies of Pythagoras, Plato and Aristotle.

b) Middle East/North African

Islam

The Koran is less ambiguous than Genesis about the relationship of human beings to nature. According to the Koran, Allah created the first man and woman, Adam and his wife, from a clot and breathed into His creation the breath of life. All other things are explicitly created by Allah for the sake of, the use of, and the benefit of man. Adam and his seed are explicitly made to be the viceroy of God on Earth. According to Islam, then, man is at the moral center of creation and is the very purpose of the creation. Man's dominion over the earth and the subordination of the creation to man is spelled out in no uncertain terms.

Man's role as viceroy on earth should not, however, be confused with tyranny. Man's dominion over the earth should be benign, not want only destructive. The doctrines of Islam are equally explicit and emphatic that man's relation to nature should be one of stewardship and not mastery. The whole world and all of its parts are understood in Islam as "signs" to man indicative of the greatness of the Creator. To deface, defile, or

destroy nature would be an impious or even blasphemous act. The earth is a temporary abode for man, and Allah rewards and punishes deeds done on Earth in present and in the next life. Persons who blaspheme against God by defacing, defiling, or destroying His creation will be punished accordingly in the next life.

According to Islam, man is made of the stuff of the Earth and he is, albeit exalted above all others, a creature among creatures. There should, thus, be a kind of fellowship between man and the other creatures. Since the natural environment is systemically integrated i.e. a seamless whole, destruction of one part of the environment will reverberate throughout the whole. Thus, since man, according to Islam, is a creature among creatures, environmental destruction is necessarily self-destruction. Islam, moreover, values scientific knowledge of nature. Natural study is encouraged and supported by the doctrine of signs.

The Islamic tradition clearly supports, more unequivocally than the Judeo-Christian tradition, a direct biocentric environmental ethic of the stewardship type. The environment, though given over to man's role and subservient to man, is the direct object of respect and care, because it is the handywork of God and a sign of His power and majesty.

According to Islam, all human beings are descended from Adam. Hence, all human beings regardless of race, colour, or national origin, are equally members of one extended family; no people are privileged or chosen; no one is inherently better than anyone else. In Islam moreover there is a strong emphasis on justice. Since environmental abuse and/or destruction are, more often than not, harmful to people, they are a form of injustice. To ruin or destroy the environment is tantamount to either bodily harm or the destruction or theft of property of both. Further, ignorance of the complex or delayed effects of action in the environmental arena is no excuse, since Islam stresses the moral importance of knowledge, no less than of justice.

c). The Indian Sub-Continent

1. Hinduism

Roughly contemporary with the emergence and development of Greek philosophy is the emergence of a more speculative and intellectual system of belief in the Hindu tradition, expressed in the Upanishads. Hindu thought during this period, gravitated towards belief in an inner, unseen, abstract reality, underlying the manifest world disclosed to the senses. For man (and other living things), it was atman, the spirit or inner self, in contrast to the body. All things in the divided, articulate world

disclosed to the senses are manifestations of one Being, Brahman. Atman and Brahman, in turn, came to be conceptually united. Thus, to know one's self, not one's personality or empirical self, but one's transcendental self, is to know the nature of all things. Much religious practice aims at the unity of self with the Self, of atman with Brahman. Upon attainment of this goal, one achieves freedom from the wheel of births, final liberation from the world. Looked at from this point of view, therefore, the empirical world is both unimportant and contemptible since it distracts the soul from finding itself, attaining liberation, and merging with the one essential, transcendental self. i.e., from achieving nirvana.

On the other hand, since the transcendental self of each person is the "same", one is led to empathy and compassion. Other forms of being, particularly other forms of life, are victims of the same deceit, frustration, and suffering as oneself and should be pitied. One cannot, thus, profit at the expense of others, either human beings or other natural environmental beings since ultimately, all are ephemeral manifestations of one indivisible Being.

2. Jainism

In Jainism, there is a fundamental dichotomy between soul and body, and mind and matter. Every living thing is endowed with a soul and all souls are equally pure and perfect in and of themselves. At the moral core of Jainism is the doctrine of ahimsa, the determination not to kill or harm any living thing which contains a soul which is as liable to suffering as oneself. The eating of meat especially is prohibited since animal empirical consciousness is more acute than plant consciousness. Mahavira, the founder of Jainism only ate leftover food, prepared for someone else, so as not to have personally caused injury even to the plants from which it was made. Moreover, food must be inspected before eating to assure that insect eggs or mites are not consumed inadvertently. Similarly, water must be strained, not to protect one's health, but to avoid consuming any organisms in the water. One ought even to sweep one's path before walking so that one's foot-fall does not injure or kill any living thing. Ahimsa is a doctrine of extreme concern for other living things. It is in itself a kind of environmental ethic.

d) The Far East

1. Buddhism

Buddhism developed from the teaching of Siddhartha Gautama who lived in India during the sixth century B.C. Buddhism, like Jainism endorses the principle of ahimsa, compassion for all

living things and a resolute determination not to destroy life. The Buddha himself chose to share his enlightenment with everyone who wished to share it, thus exhibiting his love and compassion for others. Any form of selfishness is especially ruinous to peace and enlightenment. More important, the extinguishing of desire might be a doctrine especially useful to a Buddhist-based environmental ethic. Many, if not all, environmental problems are caused by prodigal consumption. A life devoted to the cessation of desire would necessarily be a life of simplicity, austerity, and reduced consumption. A simple life of low consumption and therefore little environmental impact combined with compassion for all living things (ahimsa) would perhaps be all that is necessary for an adequate environmental ethic.

2. Taoism

The concept of Taoism is primeval in Chinese thought. The word "tao" literally means a way, or a road. The classical Taoist religious concept of the way of things was primarily two-fold: knowing and living. It was necessary to contemplate nature and reflect on the manner of things to grasp the Tao. Such nature study was not experimental but meditative and contemplative, and the knowledge forthcoming was more intuitive than intellectual. Then, one lived one's life going with the flow, that is, adapting one's manner of doing things with the Way.

Taoism thus implies a life of quietism and low activity. The Taoist posture toward life is to let events take their course in the faith that when events are allowed to take their natural course, they move with a wonderful perfection and harmony. Thus, one will find without seeking, succeed without trying.

The proper way of life is effortless action, action at one with the Way, the Tao. If one must act then one's actions should accede to and not oppose the Tao. Thus one accomplishes one's purposes in harmony with, indeed utilizing the force of, the natural course of things.

Two illustrative analogies come to mind. One may navigate to one's advantage in a smoothly, forcefully flowing river - avoiding rocks, snags, shoals and keeping to the channel - most successfully and with least expenditure of effort by taking advantage of, rather than resisting, the current. If, on the other hand, one paddles upstream, one will expend great effort, make little headway, and eventually be swept downstream headlong to one's peril. Or, as in the oriental martial arts, one has one's way against one's adversary not by opposing strength against strength, force against force, but by directing the very strength and force of one's adversary to one's advantage.

Taoism, thus, quite obviously and unambiguously provides a very sound context of thought and belief for an environmental ethic. By stressing on the necessity of harmony between man and

nature, Taoism provides the basis for a philosophy of technological development. The traditional forms of "high" and "hard" technology should be abandoned, from the Taoist point of view, for forms of "low" and "soft" technology or what is sometimes called "appropriate" technology. An appropriate technology is essentially adaptive and cooperative. Taoism seems to conceive of the environment as an articulate unity. This picture of nature as an autonomous and actual seamless dynamic whole, in which man has his fitting and appropriate place, maps well onto the world view of ecology.

3. Confucianism

Confucius also accepted the Tao, but unlike the Taoists who turned to the contemplation of nature and its orderly process for the secret of how to live well, Confucius focused on the order of human society. Confucius posited five cardinal virtues: jen or good will towards others, yi or justice, li or proper manners and piety, hsin or faithfulness to wife, children, parents, friends, etc., and chih or wisdom. Thus, Confucianism could, at best, only support an anthropocentric environmental ethic. Environmental destruction, degradation, and defilement would in most cases impose deleterious effects on other people and thus violate the first two virtues, regard for others and justice.

e) The Western Hemisphere

American Indian

American Indian thought was preserved and transmitted orally. Hence, we have no precontact texts to document our speculations. In the absence of documents an attempted reconstruction of traditional (precontact) American Indian thought may be based upon alternative resources, none of which employed alone, is entirely reliable.

American Indian cultures are by no means alike. Some groups lived almost entirely by hunting and gathering, others almost entirely by horticulture, and still others by a combination of both means of subsistence. On the other hand, there are, at a very general level, broad similarities of outlook which can be identified. Animism, the view that all things are ensouled, alive with a consciousness, was one such apparently universal belief. American Indians generally communicated with the spiritual dimension of the environment primarily through visions, dreams, songs and ceremonies. Man moved, thus, in a very personal environment, according, generally, to American Indian

representation. Powerful persons both human and other-than-human (birds, mammals, reptiles, insects, trees, shrubs, herbs, stones, mountains, rivers, lakes, etc.) must be dealt with circumspectly, with caution, deference, and respect.

This conception of the environment affords a very sound basis for an environmental ethic. (Indeed, the American Indian attitude toward the environment is often cited as a model for a contemporary environmental ethic.) One must not offend the other-than-human persons in one's environment, for the same reason one should not offend one's human neighbours. Morally speaking, persons are owed respect. It is wrong to ignore or to thoughtlessly inflict harm or destruction upon another. Hence the American Indian utilization of the natural environment was characterized by great restraint and deference for the feelings of natural beings. The spirits of animals and plants consumed for food of medicine or otherwise utilized had to be placated with sincere apologies and gifts betokening reciprocal exchange. Indeed nothing in the environment should be taken against its will or without its cooperation. Certainly nothing must be consumed without manifest need.

These basic societal attitudes toward the environment were reinforced by a practically universal American Indian cosmological model. The sky was represented as the father of all natural beings and the Earth as the mother. Hence, all natural beings are children of one set of parents, and thus, are, with respect to one another, brothers and sisters. One blood flows through all things, one spirit animates all things. Therefore, one should not only deal with animals, plants, soils and waters as persons deserving of and demanding respect, but with love and nurturing concern as befits a member of one's own family. One should treat the Earth itself with the special form of love and respect appropriate to one's own mother.

Strategies for Revival, Renewal, and Development of Environmental Ethics

a) Revival

Most traditional cultural belief systems, as the review in the previous section amply suggests, contain aspects which if revived and stressed could form the basis of equally powerful environmental ethics. The initial critical phase of the discussion of cultural traditions is crucial because it creates an awareness of environmental problems and expresses them in an historical context. Apologists for the cultural belief systems will then react to the environmentalist critics of the belief systems by identifying and emphasizing those aspects of the traditional cultural belief system upon which an environmental ethic might be based. In further open discussions those aspects

then become emphasized and reiterated within the traditional cultural belief system. Thus, an environmental ethic comes to be articulated and internalized in terms of traditional cultural ideational contexts.

b) Renewal

In many parts of the world there seems to prevail a negative reaction to global cultural homogenization and a positive emphasis on the maintenance of local cultural integrity and historical continuity. These social forces might be used in the renewal of traditional environmental ethics. For example : Problems of environmental pollution, biological impoverishment, and resource depletion and degradation may be interpreted as consequences of adopting the worst foreign attitudes, values, and techniques. In many parts of the world the worst foreign values could be identified as conspicuous consumption, materialism, hedonism, wastefulness, aimless mobility, mechanical amusement, a preference for gadgetry and heavy mechanical technology in principle, economies of scale, industrialization, production of exports, industrial agriculture, and so on. The best of indigenous traditional cultural values would vary from culture to culture. But they might be selectively identified as preference in principle for adaptive or appropriate technologies as in Chinese Taoism ; supreme value on the aesthetic contemplation of nature, as in Buddhism ; the virtue of asceticism and ahimsa as in Indian Jainism ; family based small-scale economies and subsistence agriculture, as in Confucianism ; stewardship and just distribution of both natural resources and the fruits of their orderly development, as in Islam, and so on.

Ethical environmental behavior, further, could be associated with the general renewal of traditional cultural values and attitudes. Pride in the local environmental quality might be associated with patriotism. Improvement of environmental quality could become closely associated with nationalistic aspiration.

c) Development

The nascent environmental ethics in traditional cultural belief systems may be developed in two complementary ways.

Firstly, they may be developed and extended by contemporary cultural custodians - priests, rabbis, mullahs, scholars, monks, etc. who realize the crucial importance of conservation and environmental quality, and who speak with authority and credibility for their respective intellectual traditions. Those demensions of traditional cultural belief systems which address the environment may not only be revived, they may be developed and extended by contemporary culture leaders.

Secondly, they may be developed through interface and alliance with contemporary scientific concepts of the biological and environmental sciences. Some scholars have argued that modern biological science has recently only rediscovered concepts intuitively grasped in traditional cultural world views.

Traditional environmental ethics resting upon such intuitively grasped ideas might be reinforced, enriched, and developed by means of support from the more detailed concepts of the contemporary life sciences.

Model for Environmental Ethics : The Evolutionary and Ecological Environmental Ethic

a) An Evolutionary Account of the Origins of Ethics

The very existence of ethics poses an evolutionary problem. How could voluntary limitations on freedom of action have emerged and evolved consistently with Darwin's evolutionary principles of excessive reproduction, chance variation, and intraspecific struggle for the limited means to life, with the survival and reproductive success accruing to the most competent specimens?

The resolution of this problem is not difficult. For many animal species and especially for human beings individual survival and reproductive success is enhanced in a social context in which the struggle for existence may be pursued collectively and the fruits shared. Without some sort of voluntary limitation on freedom of action, i.e. moral or moral-like restraint, social cohesion and solidarity would be impossible. Hence, ethical behavior is positively selected in social species and evolves to become ever more extensive and complex as societies grow more extensive and complex.

From this observation we may derive a general principle, viz., that social evolution and ethical evolution are correlative. As society evolves, as it grows in extent, and changes in form, ethics also grow and change correlative.

For example : Original human societies consisted of extended families and clans. Correspondingly, original human ethics were narrowly circumscribed, xenophobic, and stressed virtues contributing to small group survival - for example, the virtues of sharing, courage, loyalty, deference, and obedience to elders, and so on. Ethical behavior toward outgroup members was not enjoined. Indeed, such persons could be exploited, or even tortured and killed, without violation of the clan code of conduct.

Clans eventually merged into tribes. With this growth in the boundaries of the social community, there occurred a corresponding growth in the boundaries of the moral community -

Secondly, they may be developed through interface and alliance with contemporary scientific concepts of the biological and environmental sciences. Some scholars have argued that modern biological science has recently only rediscovered concepts intuitively grasped in traditional cultural world views.

Traditional environmental ethics resting upon such intuitively grasped ideas might be reinforced, enriched, and developed by means of support from the more detailed concepts of the contemporary life sciences.

Model for Environmental Ethics : The Evolutionary and Ecological Environmental Ethic

a) An Evolutionary Account of the Origins of Ethics

The very existence of ethics poses an evolutionary problem. How could voluntary limitations on freedom of action have emerged and evolved consistently with Darwin's evolutionary principles of excessive reproduction, chance variation, and intraspecific struggle for the limited means to life, with the survival and reproductive success accruing to the most competent specimens?

The resolution of this problem is not difficult. For many animal species and especially for human beings individual survival and reproductive success is enhanced in a social context in which the struggle for existence may be pursued collectively and the fruits shared. Without some sort of voluntary limitation on freedom of action, i.e. moral or moral-like restraint, social cohesion and solidarity would be impossible. Hence, ethical behavior is positively selected in social species and evolves to become ever more extensive and complex as societies grow more extensive and complex.

From this observation we may derive a general principle, viz., that social evolution and ethical evolution are correlative. As society evolves, as it grows in extent, and changes in form, ethics also grow and change correlatively.

For example : Original human societies consisted of extended families and clans. Correspondingly, original human ethics were narrowly circumscribed, xenophobic, and stressed virtues contributing to small group survival - for example, the virtues of sharing, courage, loyalty, deference, and obedience to elders, and so on. Ethical behavior toward outgroup members was not enjoined. Indeed, such persons could be exploited, or even tortured and killed, without violation of the clan code of conduct.

Clans eventually merged into tribes. With this growth in the boundaries of the social community, there occurred a corresponding growth in the boundaries of the moral community -

one was required to behave morally towards members of one's tribe as well as members of one's family or clan. Tribes eventually merged into larger social units - nations or countries - with corresponding modifications and amplifications of the older ethical rules and principles.

Today, we are witnessing the merger of nations into a global community of humans. This "global village" has become an emergent reality because of multi-national economic interdependency and because of transportation and communication technologies. Corresponding to this emergent global phase in human social evolution, there is the new "human rights" moral ideal. Regardless of race, creed, or national origin, being a member of the human species entitles one to membership in the moral community, and confers upon one human dignity and basic human rights.

b) Transition to Environmental Ethics via Ecological Concepts

If the natural environment is represented in ecology as a community or society which includes mankind along with other natural kinds and if ethics have developed correlatively with growth and development of the perceived representation of social or communal organization, then a secular, acultural, global environmental ethic, based upon ecology, is clearly possible.

All human behavior is psychologically motivated by desires, feelings, emotions, and passions. Moral behavior is motivated by other-oriented feelings such as love, sympathy, and beneficence as opposed to the self-oriented feelings such as hunger and thirst, anger, jealousy, and so on. These feelings first evolved to facilitate parental care and hence more successful reproduction. From that basis, these feelings evolved to embrace other members of the immediate family, siblings, parents, and from thence, more generally, to members of the extended family or clan. Special feelings arose, further, for the social unit or group as a whole. Once evolved to this point, the moral sentiments gradually overflowed to genetically unrelated members of a gradually expanding society. Now, the general world view of the modern life sciences represents all forms of life on the planet Earth both as kin and as fellow members of a social unit - the biotic community.

This evolutionary/ecological conception of the Earth and its biota triggers or actuates the moral sentiments of affection, respect, love, and sympathy with which we human mammals are endowed.

c) The Principles and Precepts of the Evolutionary-Ecological Environmental Ethic

This recommended environmental ethic provides moral standing for individuals and for the environment as a whole. Individual specimens of other species are fellow members of the global biotic community, just as individual human beings are fellow members of the global human community. Hence, all living individuals regardless of species have moral standing in the environmental ethic here envisioned, just as all human individuals regardless of race or nationality have moral standing in the human rights ethic presently gaining wide currency.

The principles and rules of environmental ethics should enable and facilitate social interaction in the biotic community and they should to some extent mirror the organization of the biotic community. Since the currency of the economy of nature is energy and energy is transferred from one form of life to another, it cannot be wrong for one living being to kill and eat another in this biology based environmental ethic. Rather, individuals of other species have a right to respect and to be allowed to strive to play their special roles in the biotic community. Our duty is to refrain from interdicting or interfering with the actualization of their natural potentialities and to respect them for what they are.

Our environmental ethical responsibilities and obligations to fellow members of the biotic community and to the environment as a whole are not in conflict. Because the biotic community is a society or community of a fundamentally different kind than a human community or society, the sort of treatment appropriate to members of the biotic community is not the same as the sort of treatment appropriate to members of the human community. Members of the biotic community should be respected for what they are and should be, to the extent possible, permitted to fulfill or actualize their natural potentialities. Living in accordance with these obligations to our fellow members of the biotic community would have the effect of preserving and fostering the diversity, integrity, and stability of the ecosystem as a whole, since the ecosystem as a whole is composed of its participating, functioning members.

Implications for Environmental Education

Ethical education must be indirect and subtle to be successful. The principle psychological assumption upon which the foregoing suggested acultural evolutionary-ecological environmental ethic rests is that human beings are endowed with distinctly moral sentiments which are triggered or actuated by the perception of someone as a fellow member of the society or

community to which one belongs. Hence , prior to the direct inculcation of environmental ethical precepts or rules, an evolutionary-ecological worldview should be instilled.

First a generally vivid conception of the earth as a small planet orbiting an ordinary, minor star, in a spiral galaxy in the immensity of the four-dimensional space/time continuum of the universe at large, should be instilled. Next, the emergence of human beings may be stressed. Thirdly, the oneness of mankind with nature as a whole and the relatedness of mankind with other species may be reinforced by general ecology.

Suggested Environmental Action and Legislation

In the nineteen seventies concern was focussed primarily on resource depletion, particularly of fossil fuels, and the pollution of surface and ground waters, the atmosphere, and soil. The problems of resource depletion are primarily problems for an indirect, anthropocentric environmental ethic. Pollution from industrial, agricultural, and municipal sources is a genuine concern both of direct biocentric environmental ethics (of which the suggested evolutionary-ecological environmental ethic is one model) and of indirect anthropocentric environmental ethics, since pollution substantially affects the biotic community as a whole and its individual members respectively as well as human health and well being. The problem of biological impoverishment, however, should head the list of priorities for environmental action and legislation, since the primary impact is felt by non-human members of the biotic communities and by biotic communities themselves and because in its most extreme manifestation, species extinction, unlike the problems of resource depletion and environmental pollution, it is irrevocable and irremediable.

Conservation, therefore, of local natural communities, regional ecosystems, and distinctive biomas should be stressed as a matter of highest moral and legislative priority. Economic pressures for development should be balanced by conservation. Reasonable preservation of swamps, marshes, bogs, wetlands, forests, dunes, prairies, and savannahs should be regarded as a primary environmental ethical obligation.

Highest and uncompromising priority should be placed on the conservation of species. One legislative goal in every nation of the world and/or for international treaty should be legislation roughly patterned after the U.S. Endangered Species Act of 1973. This includes an endangered species critical habitat, not just its preservation under artificial circumstances as in botanical or zoological gardens. Protection for threatened tropical species and for the rain forest biome is of the highest moral and legislative priority.

B. DISCUSSION

Generally , the chapter was well received with minor alterations suggested . These are ; to condense , where possible on the lengthy expositions presented for the " Judeo-Christrian " and " Greco-Roman Historical Roots " as has been shown to be possible during the preparation of the resume , without hampering understanding of the topics involved .

To the fourth line on page 447 in the sourcebook is to be added the words "...on Earth in the present and in the next life " and to omit "...in the next life " in line number six . The section 8.4.a in the sourcebook dwells on Darwin's theory of evolution . The participants felt that since Darwin's theory is not universally accepted , the section dealing with this theory should be reduced to a few lines with a reference at the end for interested readers who want to pursue the topic further . It was felt that the reduction would not significantly affect the section since the evolutionary process for ethics could be presented from a historical angle and also from the angle of development of human societies . It was also felt that the title for section 8.4 in the sourcebook should omit the words " " A Recommended Acultural " so that the title becomes " Model for Environment .." since no specific recommendation was made . In section 8.5 (Implications for Environmental Education) , the content should minimize the stress on Darwin's theory as mentioned earlier . Another comment is that section 8.6 on Suggested Environmental Action and Legislation is limited to conservation issues only and fails to discuss other issues , for example, on education policies action for NGOs, etc.

XII . DISCUSSION ON LOCAL ADAPTATION OF THE SOURCEBOOK.

Various groups of people are interested in the use of this sourcebook . The idea in this discussion is to find the possibilities as to how best it can be adapted for the use of various interest groups.

The sourcebook has no geographical boundary which means it can go anywhere and it will be published in many different languages . Target groups are expected to prepare suitable material that are appropriate to the group of people they are dealing with .

There are a few suggestions and recommendations that have been put forward . For one , the Ministry of Environment or related government agencies should be actively and seriously involved in the local adaptations of the sourcebook considering that there are intervening factors in every country in the use of the sourcebook such as language barrier , diversity in the academic background of key personnel as well as their interests. In this regard , there is the need to explore avenues or possible approaches to the problem .

An example of a process in the local adaptation of an environmental education teaching-training module for secondary school science teacher in India was mentioned . In the beginning, a small group of three teacher trainers were invited to examine the module for possible adaptation . In turn , these three teacher trainers organised a seminar for thirty science teachers and the suggestions from this group served as input for the adaptation of the module in the light of which it was revised .

Drawing out from the merits of the above-mentioned example , an added feature was introduced by the Philippines participant on the proposed implementation of the sourcebook on Non-Formal Environmental Education as soon as this has been finalised by UNESCO . Considering that the key personnel , who are the intended end-users of the sourcebook , come from different ministries or groupings with different background orientation , it was suggested that an exploratory validation of the sourcebook will also be done by groupings . This will follow the seminar type model as has already been illustrated . After the feedbacks from the representative ministries have been taken, the sourcebook will be modified depending on the feedbacks . After proper consultations with , and approval from the authorities concerned , a nationwide orientation seminar for key personnel by the concerned ministry could be implemented . The existing institutional structures expected to handle this are the Ministry of Education , Culture and Sports together with the support of the other government agencies such as the Ministry of Human Settlement . As to the group of personnel that will be trained first will depend on the nature of environmental problems which the government perceives as most deserving of attention .

The Malaysian participants from the Ministry of Education and the Ministry of Science , Technology , and Environment informed that the collaboration in the local adaptation of the sourcebook is possible . In addition , non-governmental organisations such as " Friends of the Earth " will likewise collaborate in the adaptation of the sourcebook including its future use .

In India , there is already an existing institutional structure , which is the Ministry of Environment , that will undertake the implementation of the Non-Formal Environmental Education Sourcebook for its local adaptation and eventual use in that country .

Plans for local adaptation of the same sourcebook in Sri Lanka , Thailand and Indonesia are also being mapped out as envisaged by the participants of these countries .

In this respect , there should be a close contact between UNESCO and respective government , Departments of Environment , Environmental Protection Agencies , universities and institutions and interest groups . This is important for an efficient communication . Furthermore , the adaptation of the sourcebook should be locally relevant so that they can be fully utilised in the local scene .

UNESCO should be more active in organizing seminars that include all interest groups so that it will have a direct impact on the educators . The task of promoting the sourcebook should be the responsibility of the Ministry of Environment and related government agencies . The agricultural extension education can perhaps be one of the targets of the sourcebook . Moreover , the ministry concerned should be able to utilise the sourcebook .

On the national scale , the ministry concerned should be the main target for the sourcebook . The other important thing that should be included is that environmental education should be incorporated into the academic curriculum of schools and institutions of higher learning .

APPENDIX I

AGENDA

1. Opening of the Workshop
2. Country Reports
3. Presentation on the UNESCO/UNEP International Environmental Education Programme
4. An Overview of the Development and Implementation of the Non-Formal Environmental Education
5. Some Basic Knowledge About the Environment
6. Environmental Problems and Sound Development
7. Energy and Its Uses
8. Environmental Ethics
9. Closing of the Workshop

APPENDIX II

I. Working Document:

Sourcebook Non-formal Environmental Education (draft)

II. Reference Documents:

1. Final Report, Intergovernmental Conference on Environmental Education 1977, Tbilisi, USSR, UNESCO.
2. Prospect, Vol. VIII, No 4, 1978, UNESCO.
3. International Environmental Education Program Brochures
4. Education and the Challenge of Environmental Problems ENVED - 4., UNESCO.
5. International Training Course, Lecture Materials, Vol. I and II., UNESCO.
6. Environmental Education: Module for Preservice Training of Teachers and Supervisors for Primary Schools EE Series No.5, UNESCO.
7. Environmental Education: Module for Preservice Training of Social Science Teachers and Supervisors for Secondary Schools; EE series No. 9, UNESCO.
8. Environmental Education: Module on Desertification; EE series No. 16, UNESCO.
9. Environmental Education: A Comparative survey of the Incorporation of Environmental Education into School Curricula; EE series NO. 17, UNESCO.
10. Educational Module on Environmental Problems on Cities; EE series No. 4, UNESCO.
11. Environmental Education: Module for Inservice Training of Social Science Teachers and Supervisors for Secondary Schools; EE series No. 10, UNESCO.
12. 'Proceeding of Regional Conference on Environmental Education in ASEAN Universities and its Transfer' Universiti Pertanian Malaysia, 18-21 1981. UPM.

APPENDIX III

OPENING AND CLOSING ADDRESSES

1.

THE OPENING ADDRESS

BY DR. SALIHAN SIAIS, ACTING DEAN
FACULTY OF SCIENCE AND ENVIRONMENTAL STUDIES (UPM)
AND CHAIRMAN OF THE ORGANISING COMMITTEE

Yang Berbahagia (The honourable) Prof. Dato' Dr. Nayan Ariffin, Vice Chancellor of Universiti Pertanian Malaysia;
Our distinguished representative of UNESCO, Dr. Abdul Ghafoor;
Our distinguished guests and participants;

Ladies and Gentlemen,

First of all, on behalf of the workshop committee, I would like to welcome everybody to the UPM campus, and to our overseas friends, a warm welcome to Malaysia and I sincerely hope, your stay here will be a pleasant and a memorable one.

First and foremost, I would like to take the opportunity to extend our sincere thanks to UNESCO for sponsoring this workshop and to Dr. Ghafoor personally, for his special interest and help given to us. Without these supports, the workshop would not have been possible.

Thanks must also be given to individual participants from various countries who has taken the trouble to make available to us, reports from their countries, which will be presented today; thanks are also due to the educators, who have prepared the resume of the various chapters to be discussed during the week; the various government and non-government agencies who have sent representatives to participate in the workshop.

I would also like to express my thanks to the Director of Extension Education Centre Universiti Pertanian Malaysia, who has given us the permission to use the buildings and facilities for the purpose of this workshop. Last but not least, I would like to thank members of the organising committee for all the work that they have done to make this workshop a successful one.

Considering that the participants are from various disciplines and organisations, I am sure that the discussion on the format and contents of the draft source book would provide invaluable input to the preparation of the final version of the source book in Non-Formal Environmental Education. I wish you all an enjoyable and lively sessions during this coming 5 days.

Finally, if for what so ever reason, the facilities provided are not to your satisfaction, I would like to apologise for all the inconveniences arise. Please do not hesitate to approach me or any member of the organising committee and we will try our best to fulfil your requirements as we would like the time spent here to be as pleasant as possible.

Once again, thank you.

2.

ADDRESS AT THE OPENING SESSION

BY DR. ABDUL GHAFOOR, PROGRAMME SPECIALIST, UNESCO, PARIS

Mr. Chairman,
Mr. Vice Chancellor

Ladies and Gentlemen,

It is a pleasure for me to welcome you on behalf of UNESCO to the Subregional Training Workshop on Non-formal Environmental Education organized by Universiti Pertanian Malaysia in cooperation with UNESCO-UNEP International Environmental Education Programme. The Workshop is organized within the framework of UNESCO's Programme and Budget for 1984-1985 as an activity of UNESCO-UNEP International Environmental Education Programme (IIEP).

The objectives of the Workshop are to familiarize media personnel and the personnel concerned with training components of rural development, adult education and literacy projects with the contents of a Sourcebook in Non-formal Environmental Education, to study possibilities for its local adaptation and to enhance exchange of information and experience in the development of non-formal environmental education among the participating Member States.

The Sourcebook in Non-formal Environmental Education which serves as a working document for this Workshop has been developed by UNESCO-UNEP International Environmental Education Programme with the following objectives:

- To develop in its target groups an awareness about the environment, its quality and its problems;
- To provide its target groups with environmental knowledge for enhancing the understanding of human-environment relationship;
- To foster in its target groups positive attitudes towards the environment and its improvement which could lead to actions and decisions for the conservation of the environment and the improvement of its quality;
- To enhance environmental literacy in the context of life-long education

The Sourcebook in Non-formal Environmental Education has been prepared through a long process which has involved the collaboration of higher education institutions from different parts of the world. The objectives and content orientation were prepared in UNESCO, Paris and circulated to numerous institutions and professionals for comments and critiques upon which they were revised. Institutions interested in the preparation of certain chapters were identified. Chapters 1 and 2 on the Overview and Implementation of Non-formal Environmental Education were prepared at the Rene Dubos Center in New York City. Chapters 3 and 4 on the Environment and Environmental Problems were prepared at the Faculty of Science and Environmental Studies at Universiti Pertanian Malaysia, and that is a major reason for having the workshop here. Chapters 5, 6 and 7 on Natural Resources, Energy and Its Uses and Development were prepared at Charles University in Czechoslovakia. Chapter 8 on Environmental Ethics was done at the University of Wisconsin in the U.S.A. Each team of writers prepared a detailed outline for comments and critiques and then two or three drafts of the relevant chapters. All the draft chapters were coordinated, revised and edited towards the current version, submitted at this Workshop, by the National Council of Education Research and Training in New Delhi, India. The comments and critiques of this Workshop on the Sourcebook will be appreciated for its future revision.

The major elements of agenda of the Workshop involve presentation on the UNESCO-UNEP International Environmental Education Programme, country reports highlighting non-formal environmental education development at the national level in the participating countries, and the presentation and discussion of the eight chapters of the Sourcebook.

In addition to the above it is envisaged to have first hand information on the development of formal and non-formal environmental education in Malaysia. The pioneering experience especially the experimental introduction of the subject of Man and the Environment to replace the subjects of science, health, history, geography and civics at grade 4 which will be followed in grades 5 and 6 and with subsequent teacher education change is of most interest to curriculum developers and teacher educators in environmental education. Such a curriculum change is based on the strategy to relate teaching learning specially at primary school level to the totality of the environment which I believe is the way children perceive the environment and interact with it. We look forward to the feedback from this experiment as it will pave the way for further development of environmental education in Malaysia and in other interested countries as well. Furthermore, this educational innovation shall not rest inside the school walls as the students who go through this programme will share their thoughts and school experience with adults at home and in the community and thus will have a multiplier effect in enhancing non-formal environmental education.

Ladies and Gentlemen,

Education is the transmission of human experience and cultural heritage from generation to generation. Environmental Education in this context is the educational process through which is imparted, to the general public environmental awareness, knowledge, skills, attitudes and commitments which could lead to actions for the preservation and improvement of the environment. Change of attitudes leading to commitments and actions especially in the adult population takes time and needs to be approached through a coordinated efforts of the media and the press, rural development, adult education, extension and continued education and other non-formal education projects.

Environmental concern, issues, problems, and quality can be considered one of the rare teaching subjects that can bridge the thoughts and feelings of the members of a family, community, nation, subregion and even the international community which could lead to solidarity in the preservation and improvement of the environment and its quality. Thus, the need for formal and non-formal environmental education. It is in this context that the need for the current and similar training workshops and seminars for key personnel are conceived. We hope that the current training workshop is followed by similar seminars and workshops at the national level by the concerned institutions of the participating countries.

Non-formal environmental education is not an unknown topic in this subregion because numerous activities undertaken by governmental and nongovernmental organizations are found in the participating countries. In India, the Environmental Education Essay Competition and the Environmental Study Camps are such examples. In Sri Lanka, the Central Environmental Authority (CEA), organized Posters Competition on environmental themes such as deforestation, soil erosion, water - a vital resource. They are also preparing video-films and slides on the above topics to be shown on television and presented at meetings. Similarly, student readers are prepared for high school students. In China environmental problems are depicted in cartoons in the news papers for general public awareness. In the city of Jakarta in Indonesia, the UNESCO-UNEP International Environmental Education Programme supported a Pilot project which prepared materials for primary school and teachers and slides on same topics were prepared and shown to the general public in movie houses during the intervals for advertisements. Numerous similar activities are undertaken in Malaysia and the Philippines. We will know more about these activities during the presentation of country reports by the participants.

Here I may add, Mr. Chairman, that this may not be our first and last activity with Universiti Pertanian Malaysia. In 1976 the Dean of the Faculty of Science and Environmental Studies attended the UNESCO Expert meeting on Environmental Education in Bangkok. He and the former Head of the Department of Environmental Science were received in UNESCO, Paris, on different occasions. Universiti Pertanian Malaysia has prepared, as mentioned earlier, two important chapters of the sourcebook under consideration in this workshop. UNESCO sponsored and supported here at Universiti Pertanian Malaysia the Regional Conference on Environmental Education in ASEAN Universities and its Transfer in 1981. Today's workshop is the second joint meeting. I am sure if something happens twice it could happen thrice. On this context we look forward to future activities with UPM possibly in the organization of one of the future, subregional training workshops on teacher training in environmental educational or curriculum development in or the incorporation of Environmental Education or the incorporation of Environmental Education into the curricula and teacher training for agricultural and industrial schools, or the incorporation of Environmental Education into university general education which are the priority training activities of UNESCO-UNEP International Environmental Education Programme for 1986-87.

Ladies and Gentlemen,

On behalf of UNESCO I thank the Government of Malaysia for facilitating the organization of this Workshop in the naturally and socio-culturally rich and hospitable environment of Malaysia. My special thanks go to Universiti Pertanian Malaysia, especially to its Faculty of Science and Environmental Studies in organizing the Workshop in cooperation with UNESCO-UNEP International Environmental Education Programme. I thank the Member States for sending their participants to this workshop.

We hope that the results of the Workshop will have a "multiplier" effect in the participating Member States for enriching the non-formal education activities and projects with respect to environmental concern and awareness, understanding and knowledge which could lead to actions towards the improvement of the environment and the solution and prevention of its problems by the general public for the present and future generations.

3.

WELCOME AND OPENING ADDRESS

BY PROFESSOR DATO' DR. NAYAN BIN ARIFFIN,
VICE-CHANCELLOR UNIVERSITI PERTANIAN MALAYSIA AT THE OPENING
CEREMONY OF THE "SUB-REGIONAL TRAINING WORKSHOP ON NON-FORMAL
ENVIRONMENTAL EDUCATION FOR ASIA", 18-22 NOVEMBER, 1985 AT
UNIVERSITI PERTANIAN MALAYSIA

Ladies and Gentlemen,

I am honoured to be with you today for the opening of the Sub-regional Workshop on Non-Formal Environmental Education for Asia. May I take this opportunity to welcome you to our campus in Serdang and I hope that your visit will prove to be both rewarding and pleasant.

Ladies and Gentlemen,

We at UPM have been interested in the issues concerning Environmental Education for a long time. This is the second time that Universiti Pertanian Malaysia has been involved in the organisation of a meeting of educators who are concerned with the preservation of our environment. The first was the "Regional Conference on Environmental Education in ASEAN Universities and It's Transfer" held in August 1981. At the conference the participants examined in depth the FORMAL aspects of the teaching of Environmental Education and they took a hard look at the different curricula and approaches used in universities in the ASEAN region. I have been informed that this second meeting, which is an appropriate follow-up of the first, will concentrate on the NON-FORMAL aspects of Environmental Education. Both themes coincide with the interests of this University which has always been committed to addressing this issue for the benefit of the country. Indeed, Universiti Pertanian Malaysia has established an integrated programme in Environmental Education in Malaysia and awards a Bachelor of Science in Environmental Studies in the Department of the Environmental Sciences which was established in 1974 concurrently with the enactment of the Environmental Quality Act of 1974.

Ladies and Gentlemen,

Almost all countries have some form of environmental control legislation. In Malaysia, we have introduced various legislations under the Environmental Quality Act in 1974. For example, through the enforcement of Standards for waste water effluents, we have managed to bring under control pollution from the agro-based and related industries. However, these are only

tools in our environmental management. The basic causes of environmental problems which we have cannot simply be removed by legislation. The co-operation of people of all walks of life is essential. Effective upkeep of environmental quality must be shared by every individual whose actions help to promote a clean and healthy environment and whose awareness and involvement will contribute to the maintenance of an ecological balance to ensure the renewability of our natural resources. Therefore, Environmental Education must be provided at all levels in the formal education system as well as informally at all times. Whether formal or informal, Environmental Educators must aim at developing ethical considerations in regard to the environment which will be the corner stone for the establishment of a good and healthy environment. An environmental ethic would impose restraints on human behaviour in relation to the natural environment. To cite an example: Many countries have laws to prevent the littering of public highways, parks, and other public owned land. One may still, however, litter one's own property. An environmental ethic might discourage one from doing so. Environmental ethical considerations in education should be designed to trigger off or actuate the moral sentiments of affection, respect, love and sympathy with which humans are endowed towards fellow human beings and the biotic community i.e. the environment. It is important to understand not only what our environmental problems are such as pollution, shortage of food and shelter, degradation of the quality of soils and other ecosystems - but why they have arisen and what preventive measures can be taken. Careful consideration should also be given to each of the dimensions in the overall decision making process affecting the environment and when remedial measures need to be taken they should least disrupt social-order, economic well being, and environmental quality.

Ladies and Gentlemen,

In Environmental Education we should impart knowledge, skills, and commitments to improve and protect environment. We should also consider all means available to inculcate an appreciation of a pollution-free environment at all levels of society and across all age groups as quickly as possible. The aim in Environmental Education, whether formal or non-formal, should also aim to avoid despair, and to create a positive attitude in judgements pertaining to environmental control.

This Workshop, however, will concentrate on the Non-Formal aspects of Environmental Education; more specifically on the first draft of the Sourcebook in Non-Formal Environmental Education. You will be looking on the material which is aimed at informing the layman about his environment. Careful attention will have to be given to the style of presentation, language, clarity, and content so that it could be profitably used for those who form the target group.

Ladies and Gentlemen,

In your deliberations, I understand you will be looking at and examining the material your colleagues from different parts of the world and in Asia have compiled. Judging from the aims of the workshop you will be going through the sourcebook, chapter by chapter; and I presume, with a fine toothcomb; which could be tedious. But your common interest and commitment, I am sure, will ultimately triumph. I also anticipate that modifications may have to be made; and priorities may have to be altered to suit the needs of different countries if the sourcebook is to serve its purpose.

Ladies and Gentlemen,

I am sure that you will bring to this discussion your wealth of experience and expertise and out of your collective wisdom this important sourcebook will take shape and contribute towards the creation of environmentally conscious and committed citizens in Asia. I wish you all success in your deliberations and on this note, I declare this workshop on Non-Formal Environmental Education open.

Thank you.

CLOSING ADDRESS

BY THE DEAN OF THE FACULTY OF SCIENCE AND ENVIRONMENTAL STUDIES AT THE CLOSING CEREMONY OF THE "SUB-REGIONAL WORKSHOP ON NON-FORMAL ENVIRONMENTAL EDUCATION FOR ASIA " , 18-22 NOVEMBER 1985 AT UNIVERSITI PERTANIAN MALAYSIA

Distinguished Representative of UNESCO;

Honoured Guest and Participants,

Ladies and Gentlemen,

I am appreciative of the honour in having been invited to officiate the closing of the "Regional Workshop on Non-Formal Environmental Education".

The past four days have witnessed indepth discussions and exchange of ideas on the issues and contents of the "Sourcebook on Non-Formal Environmental Education" so that the body of knowledge in environmental matters could profitably be transferred beyond academia to the people who form the target group. In this sense, the seminar is a first in Malaysia, marking the beginning of constructive coordinated efforts for optimum impacts in the field of Environmental Education.

The general public's access to Environmental Education can be realised through non-formal channels like the news media, citizens groups, consumer organizations, clubs, societies, and non-governmental organizations. Among these groups and with the formal institutions, there need to be a free flow of relevant information for Environmental Education. All information need to be disseminated in a straightforward and simple manner without loss of content. I hope that upon your return, you will put emphasis towards realizing this goal in your own respective countries. Stimulated by the frank and free discussions which you have had in this workshop each of you can be expected to go forth to work resolutely for the advancement of non-formal Environmental Education within your region.

Ladies and Gentlemen,

I share with you a common goal to promote the growth and development of Environmental Education, both, formal and non-formal. The future of our earth as an environmentally pleasant habitat is reward enough to make it worth our efforts. With great optimism for the success of Environmental Education and with great pleasure for the honour, I declare this workshop closed.

Thank you.

APPENDIX IV

ORGANIZING COMMITTEE

CHAIRMAN	Dr Salihan Siais (Acting Dean, Faculty of Science and Environmental Studies)
SECRETARY	Dr Anhar Suki (Head, Dept. of Environmental Science)
TREASURER	Dr Mohd. Ismail Yaziz (Lecturer, Dept. Env. Sc)
MEMBERS	Mr Abdul Wahid Ghazali (Lecturer, Dept. Env. Sc)
	Mr Ahmad Bongsu Abd. Hamid (Lecturer, Dept. Env. Sc)
	Mr Azman Zainal Abidin (Lecturer, Dept. Env. Sc)
	Miss Lee Siew Hoon (Lecture , Dept. Env. Sc)
	Mr Mohamad Pauzi Zakaria (Lecturer, Dept. Env. Sc)
	Mohd. Kamil Yusoff (Lecturer, Dept. Env. Sc)
	Dr Muhammad Awang (Lecturer, Dept. Env. Sc)
	Mrs Puziah Abdul Latif (Lecturer, Dept. Env. Sc)
	Mr Wan Nor Azmin Sulaiman (Lecturer, Dept. Env. Sc)
	Mr Wong Kien Kong (Lecturer, Dept. Env. Sc)
	Miss Zelina Zaiton Ibrahim (Lecturer, Dept. Env. Sc)

APPENDIX V

List of educators who presented the different chapters
of the Sourcebook

Name of educator	Chapter	Title of Chapter
1. Dr.Abdul Ghafoor UNESCO, Paris	1	Overview of non-formal Environmental Education
2. Dr. Abdul Ghafoor UNESCO, Paris	2	Implementation of non- formal environmental education
3. Ms.Zelina Zaiton Ibrahim Lecturer, Dept. of Env.Sc. Universiti Pertanian Malaysia Serdang, Selangor. Malaysia.	3	The Environment
4. Ir.Gurmit Singh President, Environmental Protection Society of Malaysia, Penang, Malaysia.	4	Environmental Problems
5. Dr.Abu Bakar Jaafar Director, Dept. of Environemnt Ministry of Science Technology and Environment	5	Natural Resources
6. Mr.Lee Choong Loui Corporate Environmental Cordinator, ESSO Production Malaysia.	6	Energy and Its Uses
7. Ms.Chee Yoke Ling Law Faculty, Universiti Malaya, Malaysia.	7	Development
8. Dr.Mohd.Ismail Yaziz Lecturer, Dept.of Env.Sc. Universiti Pertanian Malaysia, Serdang, Selangor.	8	Environmental Ethics

APPENDIX VI

LIST OF PARTICIPANTS

Dr. Porferio L. Basilio
Associate Professor ,
College of Education
Pangasinan State University, Bayambang,
Pangasinan,
Phillipines.

Dr. Cherdsak Choomnoom
Education Specialist
Functional Literacy Section,
Division of Non-Formal Education Operations,
Department of Non-Formal Education,
Thailand.

Dr. Porferio L. Basilio
Associate Professor,
College of Education
Pangasinan State University, Bayambang,
Pangasinan,
Philippines.

Mr. A. K. Gunapala
Director (Environmental Promotion)
Central Environmental Authority ,
Maligawatte New Town,
Colombo 10,
Sri Lanka.

Dr. J. P. Gupta
Deputy Director & National Project Coordinator (PE)
Directorate of Adult Education,
Ministry of Human Resource Development
JamNam House , Shahjahan Road
New Delhi,
India.

Mr. H. M. Soeharto
National Centre for Developing of Learning
Activities (BPKB)
Jayagiri , Lembang , Bandung ,
Directorate General Non-Formal Education , Youth & Sport
Department of Education and Culture ,
Indonesia.

Dr. Abu Bakar Jaafar
Director,
Department of Environment,
Ministry of Science, Technology and Environment
1st. Floor, MUI Plaza,
Jalan P. Ramlee,
50662 Kuala Lumpur
Malaysia.

Dr. Kiew Bong Heang
Persatuan Pencita Alam,
P.O. Box 10750,
50724 Kuala Lumpur,
Malaysia.

Mr. V.C. Mohan
Sahabat Alam Malaysia,
37, Lorong Birch,
10250 Pulau Pinang,
Malaysia.

Mr. Rosli b. Suleiman
Curriculum Development Centre,
Ministry of Education,
Pesiaran Duta, Off Jalan Duta,
Kuala Lumpur,
Malaysia.

Mr. Mokhtar Hj. Nawawi
Faculty of Educational Studies.
Universiti Pertanian Malaysia,
43400 Serdang,
Malaysia.

Ms Lily Hor
Department of Environment,
Ministry of Science, Technology and Environment
1st. Floor, MUI Plaza,
Jalan P. Ramlee,
50662 Kuala Lumpur
Malaysia.

Mrs. Aminah Ali
Department of Environment,
Ministry of Science, Technology and Environment
1st. Floor, MUI Plaza,
Jalan P. Ramlee,
50662 Kuala Lumpur
Malaysia.

Mrs. Sukinah Sobi
Department of Environment,
Ministry of Science, Technology and Environment
1st. Floor, MUI Plaza,
Jalan P. Ramlee,
50662 Kuala Lumpur
Malaysia.

Mr. Mohd. Rashidi b. Mohd. Nor
Department of Implementation of Special Projects
City Hall,
Kuala Lumpur,
Malaysia.

Dr. Mohd. Ismail Yaziz
Department of Environmental Science
Universiti Pertanian Malaysia,
43400 Serdang
Malaysia

Ms Zelina Zaiton Ibrahim
Department of Environmental Science
Universiti Pertanian Malaysia,
43400 Serdang
Malaysia

APPENDIX VII

LIST OF OBSERVERS

Mr. Jayum a Jawan
Faculty of Educational Studies.
Universiti Pertanian Malaysia,
43400 Serdang,
Malaysia.

Ms Chee Yoke Ling
Law Faculty,
Universiti Malaya,
Jalan Lembah Pantai,
59200 Kuala Lumpur,
Malaysia.

Mr. Lee Choong Loui
Corporate Environmental Coordinator,
ESSO Production Malaysia Inc.,
P.O. Box 10857,
50728 Kuala Lumpur.

Mr. Gurmit Singh K.S.
President,
Environmental Protection Society, Malaysia (EPSM)
P.O.Box 382, Jalan Sultan,
46740 Petaling Jaya,
Selangor, Malaysia.

APPENDIX VIII

RESOURCE PERSON

Dr. Abdul Ghafoor, Programme Specialist in Environmental Education, UNESCO, Paris.